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MEASUREMENT OF PRODUCTIVE CAPACITY: A METHODOLOGY FOR AIR FORCE ENLISTED SPECIALTIES

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This report describes the field test of a methodology for measuring the job performance of Air Force enlisted personnel, using supervisor ratings of task performance times as estimates of Productive Capacity (PC). An individual airman's PC on a particular task was defined as the ratio of the fastest possible performance on the task divided by the supervisor estimate. Overall PC for an airman could be obtained by averaging PC values for several tasks. Procedures and instruments to collect supervisor estimates were developed for four enlisted occupational specialties. During the field test, approximately 320 supervisors provided time estimates on 35 to 50 tasks for about 680 first- and second-term airmen in the four specialties. To support follow-on analyses of the validity of the supervisor ratings, observed performance times on selected tasks were collected for a subsample of airmen. Data were also obtained to examine relationships between PC and job knowledge, interest, and motivation. The report concludes with a commentary on logistical and practical considerations for collecting airman PC. Recommendations are given for research necessary to evaluate the utility of PC for establishing an empirical link between job performance and enlistment standards.

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PREFACE

This description of methods, procedures and instruments for measuring job performance by the productive capacity of enlisted personnel is part of an on-going Air Force research program to develop the technology necessary to base selection, classification and personnel management policies on empirically-derived performance data. The effort was undertaken by the Manpower and Personnel Research Division, Human Resources Directorate, Air Force Armstrong Laboratory as part of Work Unit 29220204, "Linking Job Performance and Enlistment Standards." The work is also in response to the following Manpower, Personnel and Training Needs (MPTNs):

MPTN 89-05MP - Measurement of Productivity

MPTN 89-11MP - Enlisted Selection and Classification Technology

MPTN 89-13MP - Job Performance Measurement

The project was conducted from September 1990 to September 1991 with the following overall objectives:

To develop procedures and instruments for measuring the productive capacity of enlisted personnel; and

To collect productive capacity data for four enlisted Air Force Specialties (AFSs), one from each aptitude area (Mechanical, Administrative, General and Electronic).

This report addresses only the methodological issues of measuring productive capacity. Descriptions and analyses of the data collected during this effort will be the subject of subsequent Armstrong Laboratory reports.

The authors wish to express their appreciation to the many men and women of Strategic Air Command (SAC), Tactical Air Command (TAC), the Military Airlift Command (MAC) and Air Force Systems Command (AFSC) whose willing participation as test subjects made this effort possible. In particular, we wish to thank our points of contact who, in spite of DESERT SHIELD/DESERT STORM deployments to the Middle East, arranged for the facilities and test subjects required to accomplish this project. We

also wish to acknowledge the technical guidance and assistance provided Dr. William B Alley and Dr. Lonnie D. Valentine of the Manpower and Personnel Research Division, and Dr. Mark S. Teachout of the Technical Training Research Division, Human Resources Directorate, Air Force Armstrong Laboratory. Data collection assistance was also provided by Capt Rudolph A. Smith and 1Lt Mark R. Miller, both from the Manpower and Personnel Research Division.

SUMMARY

This document describes the development of procedures and instruments for measuring the relative productive capacity (PC) of Air Force enlisted personnel. In the context of this study, an individual airman's PC, on to a particular task in his or her Air Force Specialty (AFS), is defined as the fastest possible time in which the task could be performed divided by the time it would take the airman to perform the task, as estimated by the airman's supervisor. The airman's overall PC in the AFS is calculated by averaging the PC values across a sample of tasks.

PC is of interest to Air Force personnel planners and managers as a potential measure of relative work output, which could be used to develop more cost-effective selection, classification and retention policies. While the marginal costs of increasing aptitude and experience levels in the enlisted force can be estimated, the marginal improvement in work output resulting from these higher aptitude and experience levels is currently unknown. As a result, meaningful cost-benefit analyses are precluded. However, if a practical method for measuring PC can be developed, and if PC can be linked to aptitude and experience, the Air Force will have a valuable new tool for more efficiently managing its people.

To evaluate the feasibility of using supervisor estimates of task performance times to determine individual PC values, about 320 supervisors in four AFSs (Aircrew Life Support, Aerospace Ground Equipment, Avionic Communication and Navigation Systems, and Personnel) were asked to estimate performance times for approximately 680 of their subordinates. The supervisors were predominately Staff and Technical Sergeants with around 12 years of service while their subordinates were 3- and 5- skill-level airmen with less than 6 years of service. The data were collected at ten Air Force bases in four Major Commands: Tactical Air Command (TAC), Strategic Air Command (SAC), Military Airlift Command (MAC), and Air Force Systems Command (AFSC).

To validate the supervisor time estimates, actual performance times were measured on a sub-sample of about 240 airmen. For construct validation, airmen in three of the four AFSs were given a job knowledge test which had been developed as part of an earlier Air Force job performance measurement research project. All airmen were also administered an interest inventory and a motivation scale (also products of earlier Air Force research efforts) as possible predictors of PC.

While the procedures and instruments used in this study are feasible for large-scale application, numerous administrative and logistical problems were encountered. Collecting PC data at the task level is a complex, labor intensive and time consuming process. A comprehensive and detailed data base was created which can support validation and other analytical studies--in addition to these analyses, future research should consider alternative definitions of PC that require less detailed data, and data collection procedures that are less time consuming and costly.

MEASUREMENT OF PRODUCTIVE CAPACITY: A METHODOLOGY FOR AIR FORCE ENLISTED SPECIALTIES

I. INTRODUCTION

The Problem

The Air Force has long maintained that people are its most important resource. With the advent of the all-volunteer force and the need to compete in the labor market for talented people to operate and maintain its sophisticated weapons and systems, people have also become the Air Force's most expensive resource. The FY 91 Air Force budget for active duty military personnel exceeds $20 billion--nearly $40,000 per person. Recruiting and training costs, pay and allowances and especially retirement and medical costs have all increased dramatically in the past two decades.

With labor costs of this magnitude, it is imperative that the Air Force get the most productivity for its personnel dollars--the problem is how to measure productivity in a military environment. Unlike the private sector, where an individual's contribution to corporate profits can often be quantified, the Air Force has no readily available output measure of an individual's worth. Consequently, decisions about who to select, in what jobs to place them, and how long to keep them are sometimes subject to debate. For example, a recent Air Force Times article (West, 1991) cited a January report by the General Accounting Office (GAO) as criticizing the Air Force for keeping more career airmen[1] than it needed during the FY 86-89 period. The GAO estimated that the excess experience cost the taxpayers $41.4 million in 1989. According to the article, the Department of Defense responded to the GAO study by citing greater readiness, a more experienced and productive force, and savings in accessions and training costs as justification for exceeding the planned career force objective. What seems to be missing from this debate is a quantifiable output measure by which military personnel policies and management actions can be evaluated so that the costs and benefits of such policies and actions can be assessed objectively.

In the absence of empirical relationships among individual characteristics and productivity, the Air Force manages its people by setting minimum requirements on factors that are thought to be related to

[1] Defined as those with more than 4 years of service.

productivity[2]. Personnel managers then select, classify, train, assign, promote and retain or separate airmen from the pool who meet the minimum standards--with individual preference playing a significant role in the process. Statistics on the various input factors are maintained and periodically reported as surrogates for the missing output measures. For example, the proportion of new recruits with high school diplomas and those scoring in the upper half of the Armed Forces Qualification Test (an Armed Service Vocational Aptitude Battery (ASVAB) composite) are routinely reported to the President and Congress as indirect indicators of military personnel capability[3].

To reduce some of the uncertainty in military personnel management, the Air Force has conducted scientific studies to independently validate some of the factors on which force management decisions are based against relevant performance indicators. For example, a strong empirical relationship between education level and first-term attrition (dropping out of the Air Force prior to completion of an initial service obligation) has been demonstrated in numerous studies--high school drop-outs are also likely to quit the service (see, for example, Laurence, 1987). The ASVAB has been shown to be a reasonably good predictor of success in technical training (more or less so depending on the training course) (Ree & Earles, 1991; Wilbourn, Valentine, & Ree, 1984). Also, job interest, as measured by the Vocational Interest for Career Enhancement (VOICE) instrument, correlates well with subsequent job satisfaction (Alley, Wilbourn, & Berberich, 1976). While the findings of these studies lend support to military force management practices, they address the key issue of productivity only tangentially.

Definition of Productive Capacity

More recently, the Human Resources Directorate of the Air Force Armstrong Laboratory has conducted a series of studies aimed more directly at establishing relationships between individual characteristics and

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[2] For example, Air Force Regulation (AFR) 39-1, Enlisted Personnel, sets minimum Armed Services Vocational Aptitude Battery (ASVAB) composite cutoff scores for entry into each enlisted specialty.

[3] For example, see page 40 of the January 1991 Annual Report to the President and the Congress, by Defense Secretary Dick Cheney, U.S. Government Printing Office, Washington D.C.

actual performance on the job. One set of studies, conducted as part of the broader Department of Defense (DoD) Job Performance Measurement System (JPMS) project, developed techniques to measure actual job performance in a military setting (Hedge & Teachout, 1986). Numerous techniques were investigated, including hands-on performance testing, interviews, written tests, and supervisor and peer ratings--all aimed at determining how well an individual performs a particular set of tasks. ASVAB scores were then correlated with these criterion measures as a means of demonstrating test validity for job performance as well as training success. For the limited sample of Air Force Specialties (AFSs) studied, there appears to be a reasonably good relationship between aptitude and job performance.

However, the JPMS-developed performance metrics (generally percent correct on a performance test) are not ideally suited for force structure planning, modeling or analysis purposes. Being able to predict an individual's performance test score from their ASVAB scores and experience level still leaves the policy analyst with the problem of deciding what performance level is required. The performance metrics also do not facilitate decision making about trade-offs among alternative manpower mixes, an important consideration in developing efficient force management policies.

To correct this deficiency the Air Force is exploring an alternative performance metric called productive capacity (PC) that focuses more on individual differences in the amount of work performed rather than just the quality of the work performed. The technique involves measuring an individual's performance times across a representative sample of tasks in their AFS and then comparing those times with estimates of the fastest possible performance times for the same tasks. The performance metric thus generated provides an estimate of the amount of work the individual could produce relative to the most productive person in that AFS.

The productive capacity of an individual airman in a particular AFS can be expressed mathematically as:

$$PC_a = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{T_i^*}{T_{a,i}}\right)$$

where,

PC_a = Productive capacity of airman a

T_i^* = Fastest possible performance time for task i (i = 1 to n)

$T_{a,i}$ = Airman a's actual performance time on task i

PC values theoretically range from 0 (no productive capacity) to 1 (maximum possible productive capacity); for example, a PC value of .75 for a particular airman in a particular AFS indicates that he or she could produce 75 percent of the work produced by the fastest possible airman in that AFS. While PC is not an absolute measure of output, it does provide a relative measure amenable to comparisons of alternative personnel policies and management actions--a potentially useful personnel policy analysis tool.

Background/Literature

While documented time studies date back as far as 1760, Frederick W. Taylor is generally regarded as the father of modern time study in this country (Niebel, 1976). Taylor, a mechanical engineer, began his work in 1881 to introduce scientific discipline into the management process. He advocated the division of work into tasks and elements and the collection of task performance time data to establish performance standards and rewards systems. His work was the precursor to modern industrial engineering, and is the basis for the Air Force's manpower requirements determination process. However, industrial engineering time studies were not concerned with determining what worker characteristics account for individual differences in task performance times--issues of vital interest to the Air Force and the motivation behind the present study. The literature is sparse on the use of task performance times as a criterion for validating selection, classification and retention policies and instruments.

The PC construct was first introduced by Carpenter, Monaco, O'Mara, and Teachout (1989) in a study attempting to relate aptitude and experience to supervisor estimates of productivity in one Air Force electronics specialty (328X0, Avionics Communications). Their objectives were to: (1) determine the feasibility and validity of using supervisor estimates of relative performance time as a measure of performance; (2) estimate the extent to which mental aptitudes affect this performance measure; and (3) develop and apply a prototype optimization model using the relationships among aptitude, experience, productivity and cost to set enlistment standards. Task clusters were created and Subject Matter Expert (SME) estimates of normal (benchmark) performance times for each cluster were obtained. Supervisors were then asked to rate the relative performance times of each of their subordinates on each of the task clusters. The relative ratings were obtained by asking the supervisors to identify one of their subordinates as performing closest to the benchmark time for a task cluster, and then estimating how long it would take each of the other workers to accomplish the same amount of work as the benchmark worker could accomplish in an hour.

For construct validation, supervisors' estimates of relative performance times were correlated with a variety of other job performance measures. Overall, the magnitude of the obtained correlations were characterized in the report as modest. The procedure used to solicit supervisor estimates of relative performance times may have contributed to the low validity. Each supervisor in the sample had an average of only 4-5 subordinates to choose from in selecting a benchmark worker against which to evaluate their other workers. If the benchmark workers selected were not, in fact, "normal" performers (quite possible, given the small group from which they were selected), then the relative time estimates for the other workers would be biased. A more systematic method for establishing stable performance time benchmarks might have improved the validity of the performance time estimates.

The second objective of the study was accomplished with more success than the first. A regression model was developed relating job experience (in months) and aptitude (Electronic composite from ASVAB) with PC. An R-squared of 0.44 was achieved, which the authors characterized as a "reasonably good fit" (p. 23).

To address the third objective of the study, the regression equation was used in an optimization model to determine the electronic cut score that would produce the minimum cost per productive unit over the first term of service. However, because no cost or supply constraints for high quality recruits were included in the model, a trivial solution was obtained (i.e., set the cut score at the maximum). A follow-on study (Faneuff, Valentine, Stone, Curry, & Hageman, 1990) expanded the optimization process by introducing multiple AFSs, recruiting market constraints, and quality cost differentials using hypothetical data.

A study conducted by Sackett, Zedeck, and Fogli (1988) to examine the relationship between maximum and typical performance measures is also of interest to the present research. They postulated that job performance criterion measures differ along a continuum of typical to maximum performance with maximum performance measures meeting the following criteria:

> The subjects must be explicitly aware that their performance is being evaluated
> Explicit instructions must be given and accepted that performance is to be maximized
> Performance must be measured over a short enough time period to keep the subjects' attention focused on the goal of maximum performance

They also hypothesized that typical and maximum performance levels are affected by different individual characteristics; therefore, the two types of measures should not be highly correlated. Using data collected on supermarket check-out clerks measuring task performance times under both typical and maximum performance scenarios, the authors found very low correlations between the performance measures. They also found weak relationships between measures of speed and accuracy. This work is relevant to the present study because of the need to validate the PC construct (clearly a maximum performance measure) against other job performance measures which may differ along the typical-maximum performance measure spectrum.

Purpose and Approach

The present study was intended to expand on the first objective of the Carpenter et al. study and to try some alternative techniques in areas that were not fully developed in the earlier study. Before PC can be integrated into the Air Force personnel management system, it must be thoroughly validated as a meaningful measure of performance, and practical procedures for routinely collecting the necessary data must be developed and tested. To this end, the first purpose of this study was to develop procedures and instruments that could be used to routinely collect PC data throughout the Air Force. In particular, an alternative to the "benchmark worker" approach to anchoring supervisor estimates was sought. The procedures and instruments were then evaluated in a limited field test of selected Air Force jobs.

The second purpose of the project was to collect both PC and job performance data on a sample of airmen. The PC data were collected by having supervisors estimate how long each of their subordinate airman would take to perform each of a representative sample of tasks from their AFS. Obtaining PC data via supervisor estimates offered a cost-effective alternative to actually timing airmen while they performed the tasks. However, the accuracy of supervisor estimates must be established before this technique can be used, operationally. To help determine the relationship between estimated and actual task performance times, some of the airmen in the sample were timed while performing a subset of the sample tasks.

To support future analyses of construct validity, an alternative job performance measure--a task-specific written job knowledge test (JKT)--was administered to the airmen to determine their proficiency in a subset of the tasks. Comparing PC with JKT scores may be complicated by the fact that one measure (PC) focuses on speed while the other (JKT) focuses on accuracy. Similar studies (e.g., Sackett et al.,

1988) have typically found low correlations between speed and accuracy performance measures. The PC and JKT measures may also differ on Sackett's maximum to typical performance continuum. PC appears to meet Sackett's criteria as a maximum performance measure while the JKT, being an untimed written test, may measure more typical performance levels. Sackett also postulated that motivation and ability have differential effects on typical and maximum performance. Measures of job interest and motivation were also collected on airmen in the current effort to control for these effects in follow-on construct validity analyses.

Using these data, a variety of analyses can be conducted to determine the relationship between estimated and actual (timed) PC and between PC and job knowledge, controlling for motivation and ability. Potential predictors of productive capacity, such as aptitude, experience, interest and motivation, can also be analyzed. Results of these analyses will be published in subsequent reports.

The current report focuses on the data collection instruments and the procedures used in their administration. The final two sections comment on the methodological issues encountered in the project and offer suggestions for future research.

II. METHODOLOGY

Air Force Specialty (AFS) Selection

Early in the project the decision was made to limit the initial field test of the productive capacity measurement methodology to four AFSs. Enlisted jobs in the Air Force are categorized into one of four aptitude areas (Mechanical, Administrative, General, or Electronic). One AFS from each aptitude area was desired to provide coverage of the range of Air Force jobs. Further, four AFSs were judged to be sufficient for evaluating the suitability of the methodology for application on a large scale to numerous Air Force jobs in follow-on efforts.

The specialties were chosen from among the eight previously studied under the Air Force's JPMS project to take advantage of the in-depth task analysis information accumulated (Laue, Hedge, Wall, Pederson, & Bentley, 1989). The AFSs studied late in the JPMS project were preferred to assure the currency of task-level data. Moreover, for those specialties written JKTs existed (Laue et al., 1989) that

measured knowledge on a representative sample of tasks. The availability of JKTs was an important consideration for the current effort. An alternate job performance measure was needed to evaluate the construct validity of the productive capacity measure. In a previous study of the JPMS measures, the JKTs had been shown to load on the same factor, labeled Technical Proficiency, as hands-on performance measures (Dickinson & Teachout, 1991). A final issue in selecting AFSs for the current project concerned subject availability. The JPMS experience was helpful in identifying AFSs with sufficient numbers of job incumbents to ensure that reasonable sample sizes could be achieved.

After taking into account these considerations, the following AFSs were selected:

122X0, Aircrew Life Support (General aptitude requirement)
454X1, Aerospace Ground Equipment (Mechanical aptitude requirement)
455X2, Avionic Communication and Navigation Systems (Electronic aptitude requirement)
732X0, Personnel (Administrative aptitude requirement)

Note that 455X2 appeared under the title 328X0 (Avionic Communications Specialist) in the JPMS project. The new 455X2 title reflects the Rivet Workforce combination of 328X0, 328X1, and 328X4[4]. AFS 455X2 was chosen over a more recently studied electronic aptitude AFS (324X0, Precision Measurement Equipment Laboratory), even though the more current AFS had a JKT. The choice was made because 455X2 has significantly more people assigned than does 324X0, thus increasing the chances of achieving the desired sample sizes.

Task Selection

Once the AFSs were identified, specific tasks in each AFS had to be selected for performance time estimation and measurement. It was important that the tasks be routinely performed by most first-term airmen in the AFS, regardless of command, base or duty section of assignment. The Walk Through Performance Test (WTPT) Phase I[5] tasks used in the JPMS project met this criterion (Hedge & Lipscomb,

[4] Rivet Workforce is an Air Force initiative to combine aircraft maintenance AFSs, thus reducing the number of technicians required to support aircraft deployments.

[5] Phase II tasks are specific to only one command or duty section within the AFS.

1987), and had the added benefit of being fully articulated--that is detailed assumptions, background information, tools and equipment needs, and instructions to the test administrator were well documented in the WTPT.

Unfortunately, there were not enough Phase I WTPT tasks available to adequately evaluate productive capacity measurement across a wide variety of duties (11 for Aircrew Life Support (122X0), 8 for Personnel (732X0), 26 for Aerospace Ground Equipment (454X1), and 16 for Avionic Communication and Navigation Systems (455X2)). Thus, it was necessary to supplement the WTPT tasks from the complete task inventory for each AFS. The inventories were obtained from the Occupational Measurement Squadron (OMS) at Randolph AFB, Texas. Non-WTPT tasks were chosen from the inventories based on the percent of first-term airmen performing them, again to increase the probability that airmen in the field would be familiar with the tasks. Tasks for which it would obviously be difficult to estimate performance times were omitted, especially open-ended tasks like "Conduct On-the-Job Training" or "Write Correspondence." This process resulted in an initial sampling of tasks as follows (totals include the WTPT tasks):

122X0 - 50 Tasks
454X1 - 55 Tasks
455X2 - 41 Tasks
732X0 - 38 Tasks

The tasks in three of the four AFSs tended to represent certain duty areas more than others, probably because these duty areas contained the functions most frequently performed by first-term airmen. For AFS 454X1 the tasks represented flight line Aerospace Ground Equipment (AGE) as opposed to mobile AGE; in AFS 455X2 the tasks came primarily from the repair shop rather than the flight line; and in AFS 732X0 the Consolidated Base Personnel Office (CBPO) functions were more heavily represented than were orderly room functions. The 122X0 tasks seemed to cover the spectrum of functions in the career field.

Benchmark Performance Times

The next step in the methodology was to establish a set of benchmark performance times for each task in each specialty. The benchmark times were necessary to meet two objectives: (1) to give supervisors

in the field standard reference times against which to estimate performance times for their subordinates (i.e., to keep the time estimation process from being totally open-ended); and (2) to establish the fastest possible performance times for each task to serve as the T* value in computing PC indices. To obtain the time benchmarks, experienced Non-Commissioned Officers (NCOs) from each AFS reviewed the tasks and provided their best judgments as to the range of times the task might take.

Four AFS workshops to establish the benchmark times were scheduled during December 1990 and January 1991 at Brooks AFB, Texas. Six Subject Matter Experts (SMEs) from each AFS from bases in the San Antonio area were invited to attend each 2-day workshop. Characteristics of the SMEs are shown in Table 1. Certain ground rules were established early in each workshop to ensure consistency. First, definitions of fastest, normal and slowest performance times were presented to the SMEs. The definitions reflected the maximum output nature of productive capacity by emphasizing speed, while maintaining an acceptable quality level; they were as follows:

Table 1. Subject Matter Expert (SME) Characteristics

	122X0	454X1	455X2	732X0
GRADE				
E-3	-	-	1	-
E-4	1	2	2	1
E-5	3	3	1	2
E-6	2	1	1	1
E-7	-	-	1	2
SKILL LVL				
5	1	4	3	2
7	5	2	3	3
9	-	-	-	1
SUPER-VISORS	5	5	4	5
SUBORD. PER SUP.	3.2	5.3	3.3	2.8

Fastest Performance Time: The time it would take the most proficient first-term airman in the AFS to perform the task to an acceptable level of quality, while working as quickly as possible.

Normal Performance Time: The time it would take the average, or typical, first-term airman in the AFS to perform the task to an acceptable level of quality while working as quickly as possible.

Slowest Performance Time: The maximum time a supervisor would allow a first-term airman in the AFS to work on the task before stopping him or her and assigning the task to someone else.

A variant of the Nominal Group Technique (NGT) for obtaining group consensus (Fox, 1989) was used during the workshops to elicit SME benchmark time estimates. The first step in the process involved presenting the task descriptions to the SMEs in written form and having them independently make their time estimates, with no discussion, interaction with the group, or further instruction from the workshop administrators. Next, the six independent estimates were placed on transparencies (one per task) and displayed for review by the group. Each SME, in turn, had an opportunity to provide verbal rationale (without debate) for his or her estimate. SMEs could then revise their estimates after hearing the others' rationale, if they so desired. If this process did not converge on a consensus estimate, a secret-ballot vote was taken on the two or three most common estimates to determine consensus. This process was repeated for each benchmark estimate (fastest, normal and slowest) for each task.

During the workshops the SMEs assigned benchmark times to WTPT and non-WTPT tasks separately. Within these categories, the presentation order was random. First the tasks were grouped by duty category (using a code provided in the task inventory). Then the order of duty categories was randomly selected, and then the tasks within each duty category were randomly sorted. Tasks were presented to the SMEs by duty category so they could focus on one type of work at a time as they made their estimates.

Some features of the methodology were refined over the course of the workshops. At the first workshop, Avionics Communication and Navigation System (455X2), SMEs independently assigned slowest, normal, and fastest times to the non-WTPT tasks first. Next they independently assigned benchmark times to the WTPT tasks. Then the NGT procedure was used to achieve group consensus for the three benchmark times for each task. However, when trying to achieve consensus for the non-WTPT tasks, SMEs had to add constraints and assumptions to many of the tasks before they could agree on performance times--some of the tasks were simply too broadly worded to permit reasonable performance time estimates.

For this first workshop, the independently estimated performance times on non-WTPT tasks, assigned before group discussions, do not have much meaning since SMEs might have defined the tasks in different ways. At the second workshop (Aerospace Ground Equipment (454X1)), the non-WTPT tasks were discussed before any attempt was made to assign performance time estimates. During these discussions the SMEs agreed on various constraints and assumptions regarding each task, such as how many repetitions of a procedure would be done, on what specific equipment the task would be performed, what

tools and materials would be available to the performer, and at which points in a procedure the task being measured would start and stop.

These discussions before assigning independent performance times were somewhat helpful, but subsequent discussion during the NGT sessions indicated that the constraints decided upon before assigning performance times were not always remembered or consistently used as guides when assigning times to the tasks.

At the third and fourth workshops, Aircrew Life Support (122X0) and Personnel (732X0), the non-WTPT tasks were again discussed first, but this time hard copies of the outcome of the discussions (i.e., task descriptions with the agreed-upon constraints and assumptions noted) were made for each SME to refer to when assigning their independent performance time estimates.

Based on recommendations from the SMEs at the workshops, some tasks were eliminated from further data collection activities because they were either no longer performed in the field, were redundant with another task, or were considered too trivial for timing. After the workshops the task totals were revised as follows: 122X0, from 50 to 45; 454X1, from 55 to 50; 455X2, no change at 41; and 732X0, from 38 to 36. These were the numbers of tasks taken to the field for time estimation by supervisors.

Field Data Collection

Purpose

If the Air Force is to ultimately have a productivity-based personnel planning and management system, practical procedures and instruments must be developed for routinely collecting PC information on large numbers of airmen in a broad cross-section of AFSs. Therefore, the primary purpose of the field data collection phase of this project was to evaluate the instruments and procedures described below under realistic, operational conditions. Rather than collecting data in a controlled laboratory environment, visits were made to active Air Force bases representing the full range of operational flying missions, including Strategic Air Command (SAC), Tactical Air Command (TAC), and Military Airlift Command (MAC), plus a support mission, Air Force Systems Command (AFSC). Data collection procedures were applied as they would be under "live" conditions, using real tasks and airmen in their actual work environment. While

this approach reduced control over potential errors and sources of variance in the data that were collected, it provided a more realistic evaluation of the proposed procedures and instruments.

The secondary purpose of the field visits was to collect, as precisely as possible under field conditions, estimated and actual task performance times, task knowledge information, and motivation and interest measures for use in future analytical studies to evaluate:

The accuracy with which supervisors can estimate task performance times for their subordinates
The validity of PC as a measure of job performance
The effects of aptitude, experience, motivation and interest on PC

Air Force Base Selection

Collection of PC data requires direct access to airmen, whose productive capacity is to be measured, and to their supervisors (who provide task performance time estimates on their subordinates), as well as access to their work centers to conduct actual hands-on task timing measurement. The set of bases selected required an adequate number of potential subjects to achieve desired sample sizes, while leaving enough airmen and supervisors on duty to continue day-to-day operations during the testing periods.

The base selection procedure involved the use of frequency distributions of personnel in the AFSs of interest at every Air Force base. These distributions were created using the December 1990 extract of the Uniform Airman Record (UAR), the master computer file maintained by the Air Force Military Personnel Center (AFMPC) at Randolph AFB, Texas on every active duty airman. The UAR contains numerous variables on each individual, including base of assignment and AFS, data fields that were used in creating the frequency distributions.

Bases with predominantly technical training missions (like Keesler AFB in Mississippi) were excluded from consideration. Many of the potential subjects at these bases were trainees who were not yet qualified in their AFSs. Other bases were rejected because their missions were classified, thus restricting access to airmen, their supervisors and equipment in their work centers. Bases outside the continental U.S. were also excluded to stay within the project's travel budget.

After these constraints were imposed, distributions for the remaining bases indicated that 10 bases was the minimum number needed to satisfy study requirements. The bases selected were: Travis AFB, California (MAC); Beale AFB, California (SAC); George AFB, California (TAC); Davis-Monthan AFB, Arizona (TAC); Holloman AFB, New Mexico (TAC); Langley AFB, Virginia (TAC); Shaw AFB, South Carolina (TAC); Offutt AFB, Nebraska (SAC); Eglin AFB, Florida (TAC and AFSC); and McGuire AFB, New Jersey (MAC). McGuire AFB was subsequently dropped from the study by MAC because of DESERT STORM deployments and added workload, and Charleston AFB, South Carolina was substituted.

Subject Selection

A sample size of 200 subjects per AFS was targeted because this was the maximum number that could reasonably be tested with the time and research personnel available for this project. Also, a sample of this magnitude would permit reasonable confidence in the planned statistical analyses, even with some shortfall in airman availability during the field test.

Subjects for each AFS were selected to be representative of base populations in terms of job experience, race, and gender. Job experience was an important selection factor, because it was postulated to contribute to productive capacity; more experienced airmen were expected to have higher work output. An effort was made to sample subjects over a range of job experience while still focusing on those who typically perform the hands-on technical tasks being measured (as opposed to supervisory or managerial tasks). The Air Force codes the amount of training, expertise and experience an individual has in a particular AFS by awarding a skill level ranging from 0 to 9, with skill level 0 reserved for Chief Master Sergeants and skill level 1 indicating an entry-level trainee --operationally only values of 3, 5, 7, and 9 are used[6]. Because current data on the actual number of months and years an individual has on a particular job were difficult to obtain from the computerized personnel records, skill level was used as a surrogate for experience. Thus, the sample was limited to airmen with a 3 or 5 skill level and less than six years in the Air Force. Prior Air Force studies of the relationship between job performance and experience have limited their observations to first-term airmen, those with four or fewer years of service (Alley & Teachout, 1990; Carpenter et al., 1989; Lance, Hedge, & Alley, 1987). An interest in the current

[6] Skill level is recorded as the forth digit of an individual's Air Force Specialty Code (e.g., 45532). The required skill level for each enlisted position is similarly coded in the manpower files.

project was the utility of productive capacity for force structure planning. Decisions about experience mixes needed to maintain force productivity are most germane to career airmen, those with more than four years of service. The six years of service limitation imposed on samples for this project provided the opportunity for modeling performance-experience relationships beyond the first term, while ensuring that airmen identified as study participants still performed technical-level tasks. Samples were also stratified by race and gender.

Test subjects were actually selected by the participating bases, using criteria provided by the research team, because the bases had more current information on manning, deployments and personnel status. Each base was provided a detailed matrix indicating the number of subjects required by AFS, skill level, gender and race based on the distributions of these factors at the base as of December 1990. The bases were also verbally requested to select airmen from particular duty areas in three of the four AFSs (454X1, 455X2 and 732X0) because the tasks selected for measurement in these AFSs tended to cluster in certain duty areas. Because the bases did the actual subject selection, it was not possible to stratify the sample by aptitude level (even though this would have been desirable) since ASVAB scores are not available in base-level personnel records.

Table 2. Sample Distribution

	122X0	454X1	455X2	732X0
	Goal/ Actual	Goal/ Actual	Goal/ Actual	Goal/ Actual
N	200/153	200/195	200/144	200/186
SKILL LVL	%	%	%	%
3	29/54	48/45	34/44	28/31
5	71/44	52/55	66/56	72/68
7	0/2	0/0	0/<1	0/1
RACE	%	%	%	%
Cauc	70/65	81/81	89/89	55/54
Min	30/35	19/19	11/11	45/46
SEX	%	%	%	%
Male	91/86	94/94	92/91	50/44
Fem	9/14	6/6	8/9	50/56

After the subjects were selected by the bases, sub-samples of 60 subjects per AFS (6 per base) were identified to participate in the actual task timing studies. Again, these subjects were selected to represent, to the extent possible, the base/AFS population with respect to skill level, race and gender. Table 2 summarizes the target and actual sample distributions. Overall sample size objectives were achieved in two AFSs (454X1 and 732X0) but fell about 25 percent short in the other two AFSs due to unavailability of personnel at the test sites. Junior personnel (3-levels) are substantially over represented in the 122X0

of personnel at the test sites. Junior personnel (3-levels) are substantially over represented in the 122X0 and 455X2 samples, slightly over represented in 732X0 and somewhat under represented in 454X1. A total of six 7 skill-level personnel were also tested. The racial composition is proportional to the population distribution except in the 122X0 sample, where minorities are slightly over represented. Sample gender distributions are similar to the population distribution in the 454X1 and 455X2 samples; however, females are over represented in the 122X0 and 732X0 samples.

Pilot Test

Prior to the first field data collection visit, a pilot test of all draft data collection instruments and procedures was conducted at Andrews AFB, Maryland. The primary purpose of the test was to try out each form, instrument, instruction set and procedure on a small sample of airmen and their supervisors to identify problems, resolve inconsistencies and to develop a workable sequence and schedule of events for the actual field visits. A second purpose was to familiarize the data collection team with the environment in which they would be working and to allow them to practice the procedures under realistic conditions. The pilot test proved invaluable by surfacing problems and issues prior to the first actual data collection visit. Numerous refinements to instructions, data collection forms, and scales were made as a result.

Instruments

A combination of existing and newly-developed forms and instruments were used to collect data at the ten bases. Three categories of data collection materials were required to: (1) Collect background information on supervisors, and record their estimates of task performance times for their subordinates; (2) obtain background information, job knowledge, interest and motivation measures on the airmen for whom supervisor time estimates were obtained; and (3) collect actual task performance times on sub-samples of airmen and tasks. Table 3 lists the forms and instruments, indicating which were developed specifically for this project and which were taken from prior work. Each will be described in more detail in the following sections.

Supervisor Rating Forms

The supervisors in each AFS were provided with four data collection instruments, each of which was

developed specifically for this project. The Supervisor/Airman List given to each supervisor identified the individual(s) for whom the supervisor was to provide time estimates. This form also served as a data collection instrument in that it asked for the number of months the supervisor had supervised each airman. The form also served as a cross-check on the airman testing sessions, identifying individuals who were not present or who were substituting for another airman. A copy of this form is in Appendix A.

Table 3. Data Collection Forms and Instruments

Instruments	New/Existing
Supervisor Rating Forms:	
• Supervisor/Airman List	New
• Background Information Form	New
• Tasks for Time Estimation Booklet	New
• Time Estimation Form	New
Airman Testing Forms:	
• Background Information Form	Same as Supervisors'
• Vocational Interest for Career Enhancement	Existing
• Generalized Motivation Scale	Existing
• Job Knowledge Test	Existing
• Scannable Answer Sheet	New
Task Timing Forms:	
• Tasks for Timing Booklets	New
• Task Timing Forms	New

The Background Information Form contained the required Privacy Act statement, citing the authority for collecting the data, the project's purpose and use of the information, and the voluntary nature of participation. The form was also used to collect identification data on the supervisors, including name, Social Security number, grade, AFS, base and command of assignment, duty title, and active/reserve status. The most important use of this form was to collect a series of experience variables, including total time in the Air Force, time in AFS, time in grade, time in current position, and time as a supervisor. With the exception of total time in the Air Force and time in grade, the experience information was not available in historical computerized personnel files, and thus had to be collected directly from the supervisors. A copy of the Background Information Form is in Appendix B.

The Tasks for Time Estimation Booklets began with a set of instructions inside the front cover, which the test administrator read and discussed with the supervisors (see Appendix C-1). The descriptions of the tasks began on the next page of the booklet. Because of their bulk, the actual booklets for each AFS are not included in this report, although they are available from the project sponsor. Examples of WTPT and non-WTPT tasks are shown in Appendix C-2 and C-3, respectively, for the Aircrew Life Support specialty to illustrate the differences in level of detail.

In the booklets, tasks taken from the WTPT were listed first, followed by the non-WTPT tasks; within each category (WTPT and non-WTPT), the tasks were ordered by task number. The task numbers were taken from the Air Force master task inventory--they each began with an alpha prefix indicating the general work category (e.g., in Aircrew Life Support, the "H" prefix indicates fitting and maintaining helmets), followed by a sequence number of up to four digits. In a few cases an alpha suffix ("A" or "B") was added to tasks that had been divided into two tasks by the SMEs at the benchmark workshops.

The WTPT tasks were headed by the task number and title. Following were the benchmark time estimates developed at the SME workshops. The tools and equipment needed to perform the task, background on the task, the setup configuration, instructions for the task timing administrator, and instructions for the airmen being timed, were also listed to help supervisors envision the environment in which the airman would be working. This information, along with the step-by-step description of the tasks which followed, attempted to give the supervisors making performance time estimates as complete a picture as possible of the work environment and any constraints the airmen would have to overcome.

Following the WTPT tasks in the booklets were the non-WTPT tasks. These were also headed by the task number and title and included the benchmark time estimates and any additional assumptions or steps that were generated by the SMEs at the workshops. Considerably less detail was available on these tasks compared to the WTPT tasks.

The final form used by the supervisors was the Time Estimation Form, on which they recorded their estimates. This form identified the particular AFS, followed by spaces for the supervisor's name and the name and Social Security Number of the airman being rated. The far left-hand column of the form contained the task numbers, in the same order as presented in the Tasks for Time Estimation booklets. The second column contained a set of three boxes. Here the supervisor placed a check for how often they had observed the airman perform the task in question. The boxes were labeled as "R" for regularly, "O" for occasionally, and "N" for never, following the same scale used by Carpenter et al. (1989). The next column was a time line which graphically presented the benchmark time estimates, presented in the order of fastest, normal, and slowest. The final far right-hand column of the form contained another set of three boxes labelled "Hr" for hours, "Min" for minutes, and "Sec" for seconds. It is here that the supervisors were asked to record how long the airman would take to perform the task at a satisfactory level, while

working as quickly as possible. Figure 1 shows the top of the first page of the Aircrew Life Support Time Estimation Form to illustrate the frequency and time scales.

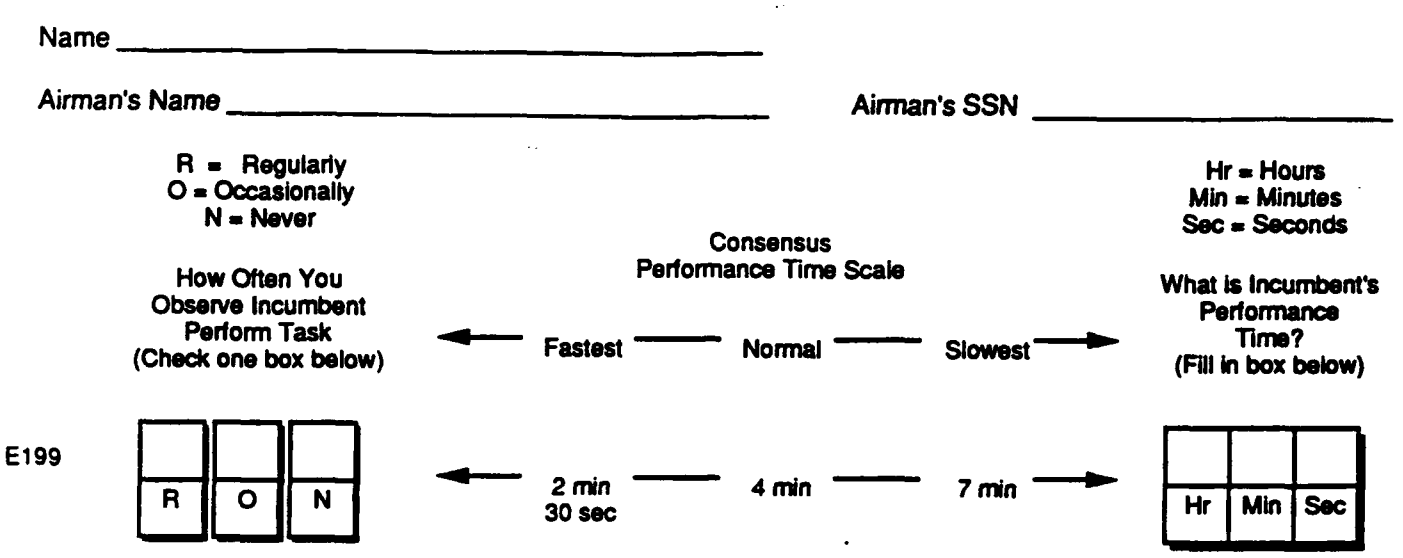

Figure 1. Time Estimation Form Example

At the end of each Time Estimation Form was a scale on which the supervisors were asked to provide an overall productivity rating for the airman being rated. The instructions and measurement scale are shown in Figure 2. Copies of the Time Estimation Forms for each of the four AFSs can be found in Appendix D.

In this specialty, consider the maximum amount of acceptable work that can be done by a person on a typical day as 100 percent. What percent of maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.

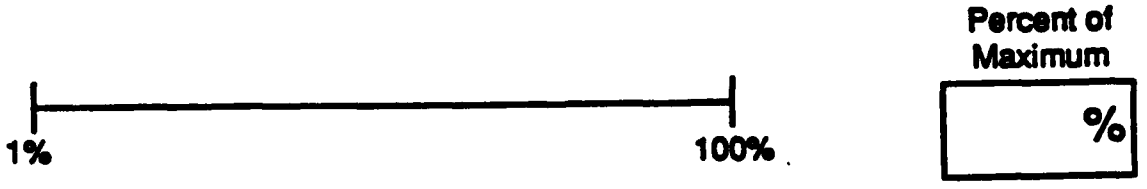

Figure 2. Overall Productivity Rating Scale

Airman Testing Forms

While the supervisors were estimating task performance times for their subordinate airmen, the airmen were being tested in a group in another room. The first form they were asked to fill out was the Background Information Form--the same form used in the supervisor rating sessions. This form was especially critical for the airmen because it was the only source of experience data (time in AFS), which was postulated to be a predictor of productive capacity.

Job Knowledge Test

One of the key issues regarding supervisor estimates of productive capacity is how they relate to other measures of job performance. Thus, one of the objectives of this study was to collect job performance data, on the same airmen for whom productive capacity ratings would be computed as a means of validating the PC construct. While actual hands-on work sample tests are generally viewed as the highest fidelity measures of job performance, their administration is extremely time consuming and expensive (Hedge & Teachout, 1986). Since the data collection phase of this study was already quite protracted and complex, a simpler surrogate for the hands-on performance measure was sought. The DoD has developed several surrogate performance measures as more feasible alternatives to hands-on performance testing, one of which is the task-specific, pencil-and-paper job knowledge test (Bentley, Ringenbach, & Augustin, 1989). Since JKTs had previously been developed for 3 of the 4 AFSs in this study, and because they are relatively quick and easy to administer and score, they were selected as the surrogate performance measure to be used.

The three JKTs were developed by the Air Force to demonstrate the transferability of an Army job performance measurement technology to another service (Bentley et al., 1989). Using the Army methodology, the Air Force based the JKTs on the specific tasks used in the WTPTs developed as part of the JPMS project. The WTPT tasks were presented to groups of SMEs from each AFS, who were asked to identify the steps that comprise the key elements of successful performance of each task. Test items were then written for each key element, concentrating on the application of the knowledge needed to successfully perform the task. All items were written in a multiple-choice format with two to five

alternative responses per item--the number of alternatives being directly related to the number of plausible incorrect responses. Alternatives were written such that only one was correct. The number of items per task ranged from two to eighteen.

A second group of SMEs was then convened for each AFS to review the items and responses for technical accuracy and correct wording. This was followed by a pilot test of each draft JKT using a small sample of first-term airmen in the field. After incorporating improvements and corrections from the pilot tests, the JKTs were administered to larger groups of airmen (25-50) to obtain item response data. Extremely easy and difficult items, those with passing rates below 10 percent or above 90 percent, were eliminated, as were items with low item-total score correlations, showing poor discrimination of airmen job knowledge levels. Additional marginal items were eliminated to keep the test administration time under two hours for each JKT.

After all revisions were made, the final version of the 122X0 JKT prepared for the JPMS project (Phase I, or common tasks only) covered 8 tasks with 70 items (4-19 items per task); alpha coefficients for the task tests ranged from -.03 to .68 (mean of .34). The final version of the 454X1 JKT used in this study (booklet B) covered 14 tasks with 75 items (2-11 items per task); its alpha coefficients ranged from -.57 to .42 (mean of .17). The 732X0 JKT (again, Phase I common tasks only) included 8 tasks with 47 total items (2-10 items per task); alpha coefficients ranged from .34 to .90 (mean of .60).

An oversight occurred in administering the 454X1 JKT in the current study. Because of the large number of test items (159), the original JKT was divided into two booklets (labeled A and B) covering the 26 WTPT tasks in the Aerospace Ground Equipment specialty--booklet A addressed 12 tasks and booklet B addressed 14. The tasks were randomly distributed between the two booklets to allow a break between testing sessions. In the present study, however, booklet A was inadvertently omitted. The reduction in task coverage would be expected to lessen the content validity of the 454X1 JKT and possibly the reliability of the job knowledge scores obtained on airmen in this specialty.

Vocational Interest for Career Enhancement Instrument

The Vocational Interest for Career Enhancement (VOICE) Instrument (AFPT 600, Form D, 1 June 1987) was selected as the vocational interest inventory for use in this study because it was specifically

designed to measure the job interests of Air Force junior enlisted personnel and was readily available to the research team at no cost. Form D of the VOICE is a 160-item interest inventory designed to measure an individual's preference for different types of work-related activities. It consists of four sections; Jobs, Work Tasks, Spare Time Activities, and Desired Learning Experiences. Under each section are listed a series of brief descriptions or statements related to the section title. For example, under Section 1: Jobs are listed 32 job titles (e.g., baker, farmer, plumber); Section 3: Spare Time Activities includes 27 activities (e.g., go canoeing, listen to an opera). Individuals indicate their preference for each item by marking "L" for Like, "I" for Indifferent, or "D" for Dislike.

The earliest form of the VOICE contained 400 items and was scored on 18 Basic Interest Scales (BIS) and 20 Occupational Scales (Alley, Berberich, & Wilbourn, 1977; Alley, Wilbourn, & Berberich, 1976). The BIS measured interest in different areas without reference to particular jobs, whereas the occupational scales expressed the level of job satisfaction examinees would be expected to have in particular DoD occupational areas. Because of the large number of scales, VOICE scoring was rather complex. Later, Watson, Alley, and Southern (1979) developed a smaller number of operational composites to reduce the number of occupational scales, and also to simplify scoring. Their factor analysis of the occupational scales dictated a minimum of eight composites.

Fairbank (1986) conducted research which led to the development of Form D of the VOICE. He identified six operational composites to predict job satisfaction in the 20 DoD occupational areas. These occupational areas encompassed the vast majority of Air Force jobs. The magnitude of the correlation between the six composites and predicted job satisfaction across the occupational areas ranged from .46 to .94. Fairbank (1986) also found that the six composites could be used in place of the BIS without significant loss of predictive power. Further, the composites could be derived directly from VOICE item responses without first calculating BIS scores.

Alley et al. (1976) demonstrated that the VOICE is related to reported job satisfaction. In the current study, it is hypothesized that incumbent job interest, as reflected by the six VOICE composites, may also

relate to job performance. Existing literature on the relationship between job satisfaction and job performance is inconclusive (Seashore & Taber, 1975).

Generalized Motivation Scale

The Generalized Motivation Scale (GMS) developed by Ringenbach (1989a, 1989b) was selected to measure motivation level for job performance. Several considerations guided the choice of the GMS for this project over other available motivation instruments. Generality of application was a key reason. Because the GMS is general in nature, rather than tied to measurement of motivation in specific environments, the instrument was judged to be suitable for assessing motivation to demonstrate skills in the different jobs studied in the project. Further, during the course of GMS development, the items had been reviewed specifically for applicability to Air Force contexts. Another desirable feature concerned its broad coverage of the construct of motivation. Item writers considered a wide range of attributes relevant to describing a motivated worker, including behaviors associated with such critical elements as motives, expectancies, and incentives. Major phases of the motivational process (preparation, execution, and reaction) were also addressed. Readers interested in a detailed description of the theoretical framework and development of the GMS are referred to Ringenbach (1989b).

The GMS instrument consisted of 30 statements to which respondents indicated their degree of agreement or disagreement using a 7-point Likert scale. Ringenbach (1989b) used variable reduction techniques including factor analysis to select the 30 items from a larger pool of 102 experimental items and to arrive at subscale content and names. Three subscales were derived: Persistence in the Face of Adversity, Goals and Plans, and Evaluation for Competence. The number of items in the subscales were 12, 10, and 8, respectively. Subscale scores were computed by summing item responses, after reversing scale values for negatively phrased items. Ringenbach's studies with samples of recruits for Basic Military Training showed the subscales to be moderately reliable. Cronbach alpha coefficients ranged from .63 to .83. Construct validity was examined by intercorrelating the subscales with those of six other motivation instruments. Results were mixed; the GMS subscales related highly with those for some, but not all, alternative motivation instruments.

A copy of the GMS instrument and instructions is in Appendix E. Note that the word "Motivation" was dropped from the title of the instrument administered to airmen in this project. The reason was to control potential social desirability bias by discouraging faked responses.

Task Timing Forms

A key objective of this study was to evaluate the ability of supervisors to estimate task performance times for their subordinates. To accomplish this part of the study it was necessary to obtain actual times on a subsample of the airmen performing some of the tasks for which estimated times were also collected. The number of tasks and airmen to be timed was limited by two factors. First, the project schedule allowed only one day per AFS per base for timing. Second, to minimize duty section disruption and reduce fatigue effects, a goal of no more than two hours of timing per airman was established. Within each AFS only the WTPT tasks were considered for timing to take advantage of the detailed instructions, equipment lists, and specific task steps available. In two of the four AFSs (454X1 and 455X2) some of the WTPT tasks were judged unsuitable for timing because they created potential safety hazards, were potentially damaging to the equipment involved, or required an excessive amount of time to perform. The following number of timing tasks were selected for timing: 122X0 - 11 tasks; 454X1 - 6 tasks; 455X2 - 8 tasks; and 732X0 - 8 tasks.

A cutoff time was established for each of the 33 timing tasks to standardize measurement procedures across all data collection sites and to prevent airmen from spending too much time on any one task. The concern was that if the tasks were left open-ended, some less proficient airmen might continue trying to perform a particularly difficult task at the expense of performing a variety of tasks. The use of cutoff times was preferred over more subjective stopping rules because not all timing sessions were conducted by the same data collection personnel, and standardization would have been problematic. The cutoff times were set at the slowest benchmark time for the task, plus 20 percent.

To maximize the sample sizes for task level analyses, a subset of the timing tasks in each AFS were designated "core" tasks for timing. The core tasks were chosen by randomly selecting tasks from the timing list until the sum of their cutoff times approached 90 minutes. This procedure ensured that a common set of tasks in each AFS was performed by each airman during the 2-hour time limit. After performing the core tasks, the airmen spent the remaining time performing as many non-core tasks as

possible to maximize the number of timed observations on each airman. This was done to maximize the potential reliability of productive capacity measures derived from actual time measurements. Table 4 lists all of the tasks in each AFS selected for timing and identifies which were designated core tasks.

Table 4. Tasks Selected for Timing

	Aircrew Life Support Specialist (122X0)
E199*	Make entries on AFTO Form 152 (chemical ensemble inspection record)
H295*	Fit the 55/P helmet using a custom liner
H303	Perform a 30-day inspection on an HGU-55/P helmet
H315	Replace the nape strap and pad
H320	Remove and replace headsets in helmet
I330	Size and fit oxygen masks
I349	Perform oxygen mask periodic inspections
J380*	Remove and install the filter elements in the CRU-80P
J383*	Perform the mask exchange in the vapor hazard area
K389	Fit or adjust a parachute harness
K398	Perform 30 day routine parachute inspections
	Aerospace Ground Equipment Specialist (454X1)
F154*	Perform an aircraft support generator service inspection
F155*	Perform a service inspection on a load bank
F162*	Perform a service inspection on a hydraulic test stand
I284*	Remove and replace an alternator belt
I300*	Replace the flare fitting on a fuel line
P549*	Perform an operator's inspection of an AF vehicle, completing AFTO Form 373
	Avionic Communication and Navigation Systems (455X2)
E110	Research and identify information regarding parts using technical data
E138*	Complete AFTO Form 349, Maintenance Data Collection Record
F169	Visually inspect receiver-transmitter (RT) units or other radio/test equipment received from supply or manufacturers
F199*	Safety wire system components
F200*	Properly set up a flightline maintenance stand
G218	Perform a minimum standards (bench) check on a ultra-high frequency (UHF) receiver-transmitter
G262*	Set up ultra-high frequency test equipment
L398	Isolate malfunctions in interphone cords
	Personnel Specialist (732X0)
E35*	Draft a message saying that a job inventory was mailed
E102*	Construct immediate inquiries to determine date of rank, unit (PAS), and duty phone for someone stationed at your base
E107*	Dispose of unclassified PDS products of only a few pages
E114*	Sign in a document and sign out again, using AF Form 614
F140*	Open and close a CRT in the CBPO
L733*	Respond to a request to release information from a member's file in accordance with the Privacy Act
O826*	Properly file 10 documents in personnel records
R1011*	Compute service dates

* Core Tasks

The timing tasks (both core and non-core) were assembled into Tasks for Timing booklets, one for each AFS. A table of contents listing the tasks to be timed was included on the first page of each booklet. Beginning on the next page were descriptions of the tasks to be timed. The task descriptions were identical to those the supervisors used in the time estimation workshops. Each task was headed by the task number and title, followed by the benchmark performance times. The tools and equipment needed for completion of each task were also listed so they could be set up before the timing study began. A standard background statement was also provided for each task to answer possible questions and to maintain consistency between bases, commands and evaluators. The configuration detailed in the task setup was also used to maintain consistency between timings of each task.

Inside the back cover of each Task for Timing booklet was a 5-point performance level scale. This scale was developed to assess how well each airman performed each task during the timing sessions. The definition of productive capacity used in this study required that tasks not only be performed as quickly as possible, but also be performed to a satisfactory level of quality. The performance level scale and description is shown in Table 5.

Table 5. Performance Level Descriptions

Rating	Performance Levels	Description
5	Exceptional	Far exceeds the acceptable level of performance. Completed all steps, critical and noncritical, efficiently (skillfully) and accurately.
4	Distinguished	Exceeds the acceptable level of performance. Completed all critical steps accurately, but not necessarily efficiently. Made very few or no noncritical errors.
3	Acceptable	Meets the minimum acceptable level of performance. Completed all critical steps accurately. Made some noncritical errors.
2	Deficient	Below the acceptable level of performance. Made some critical errors or numerous noncritical errors.
1	Unacceptable	Far below the acceptable level of performance. Made numerous critical and noncritical errors and/or could not complete the task.

In addition to the Tasks for Timing booklets, a Task Timing Form was also developed for each AFS to record the timing results, the performance level, and a frequency of task performance measure. The frequency measure used an R-O-N scale (Regularly, Occasionally, Never) to record the self-reported frequency with which each airman performed each task being timed. The frequency measure was collected

to evaluate the potential effect of direct task experience on performance time. A sample Task Timing Form (122X0 - heading and first task only) is shown in Figue 3. Copies of the complete four Task Timing Forms (one per AFS) are contained in Appendix F.

TIMING FORM - AIRCREW LIFE SUPPORT (AFS 122X0)

Examinee Name _____ SSN _____
Last First Middle Initial

Grade _____ AFS _____ Location (AFB) _____

Task E199 Make entries on AFTO Form 152 (Chemical ensemble inspection record

R O N

Time: __ . __ . __ Cutoff: 8 mins. 24 secs. Rating: 1 2 3 4 5

Figure 3. Sample Task Timing Form

Procedures

Three kinds of activities occurred during field data collection. These were: (1) supervisor task time estimating sessions, (2) airman testing sessions, and (3) task timing sessions. Table 6 summarizes the schedule of activities. The first day of each field visit, which was always Monday, was used to conduct two supervisor time estimation sessions and two airman testing sessions. Morning and afternoon sessions for both supervisors and airmen were held to ensure that all selected participants had ample opportunity to attend, considering their work schedules and other commitments. The two different kinds of activities were held concurrently, normally in rooms that were in close proximity, but in at least one case, in widely-separated buildings. The remaining four days of the field visits were used for task timing sessions, one day for each AFS.

Table 6. Field Data Collection Activity Schedule

Day	Activity
Monday morning (repeat of both sessions in the afternoon)	• Supervisor Time Estimation Session • Airman Testing Session
Tuesday	• Avionic Comm-Nav Systems (455X2) Timing Session
Wednesday	• Aerospace Ground Equipment (454X1) Timing Session
Thursday	• Aircrew Life Support (122X0) Timing Session
Friday	• Personnel (732X0) Timing Session

Supervisor Time Estimating Sessions

Preparation for the supervisor time estimating sessions began before the opening day of the field visit. A listing of all airmen and supervisors to be included in the study was provided by the base being visited. Before the first day's activities, the Supervisor/Airman Lists were prepared for each supervisor, listing each of their subordinates to be included in the study, with the Social Security number for each. These lists plus blank Background Information Forms, Tasks for Time Estimation booklets, and one blank Time Estimation Form were assembled as a packet to be handed out to each supervisor as they entered the testing room. The Tasks for Time Estimation booklets had a different color cover for each AFS to help ensure that the supervisors used the correct set of tasks.

The first activity of the session was to ensure that airmen had been properly matched to the correct supervisor. Supervisors were asked to review the Supervisor/Airman Lists for accuracy. If there was an airman on a supervisor's list that was not his or her subordinate, the supervisor was asked to identify the airman's actual supervisor, if they were present in the room. If this was not possible, an attempt was made to locate the airman's supervisor; then later in the week, that individual was contacted and asked to rate the airman. In this way, every airman who was tested also received task performance time estimates from his or her supervisor.

Supervisors then completed a Background Information Form on themselves and read the Privacy Act statement. Next they were asked to look over the Tasks for Time Estimation booklets and to assign performance time estimates to each task for each airman on their list. The test administrator read very detailed and structured instructions to the supervisors to aid them in assigning task performance times (Appendix G). As each supervisor finished assigning times to the tasks for an airman, he or she brought the Time Estimation Form to the test administrator and was given another blank form. This procedure was used to ensure that each airman was rated independently on each task, rather than having each task rated across all airmen assigned to the supervisor. This process continued until all supervisors had rated all of their airmen.

Airman Testing Sessions

A color-coded packet of materials was also prepared beforehand for each airman to be tested. The materials included the Background Information Form (the same form used by the supervisors), a scannable

answer sheet (Appendix H), the VOICE instrument, and the GMS instrument. Forms and instruments were placed inside the Job Knowledge Test (JKT) for the airman's AFS, except for the 455X2 specialty (which did not have a JKT). These packets were placed on the desks or tables, along with pencils, before the airmen entered the testing room. As airmen entered the room, they were asked their specialty, and then directed to a desk with materials of the appropriate color. The color-coded packets also enabled test administrators to quickly locate and keep track of materials used during the week.

At the time designated to begin the session, roll was called, and those missing or those present but not on the list were identified. Airmen who did not appear for either the morning or afternoon testing session were identified and, in most cases, administered the tests later in the week. Airmen who were present but whose names were not on the list were identified and in some cases, determined to be substituting for others not present. In any case, the names of their supervisors were noted, so that later in the week these supervisors could estimate task performance times for the airmen.

Airmen were then given instructions for completing the Background Information Form. They completed the form, read the Privacy Act statement, and then began to complete the tests. The test administrator read uniform instructions to the group to aid them in completing the instruments properly. Copies of the instructions are in Appendix I. The JKT was completed last, so that airmen from the 455X2 specialty could be excused.

Task Timing Sessions

Prior to each base visit, a point of contact (POC), usually a senior NCO, was identified in the work center for each AFS to help coordinate the task timing sessions. The POCs were sent a list of the tasks to be timed, showing the equipment and materials required for each. On Monday afternoon, members of the data collection team visited each POC to discuss any problems encountered in obtaining the appropriate equipment and to identify which airmen would be timed. If the work center could not support timing of some of the tasks because of local differences in equipment or procedures, the task descriptions and/or instructions were rewritten to describe conditions at the base. Rewriting tasks in the field to reflect different equipment or procedures also required the establishment of new benchmark performance times. Six NCOs in the work center were asked to independently estimate fastest, normal and slowest performance times for each modified task, using the same definitions that were used at the SME

workshops at which the benchmarks for the original tasks were established. It was not feasible to obtain group consensus on the revised benchmarks for modified tasks; only independent estimates were collected. The mean of the independent estimates of the slowest benchmark times were used to revise the cutoff times for modified tasks (the mean times were increased by 20 percent to set the cutoffs).

Two senior NCOs from each AFS were also identified during the Monday afternoon meetings to assist with the timing process and to evaluate the performance level on each task. These NCOs were 7 skill-level personnel or above who were familiar with the work center operations and equipment and who had hands-on and supervisory experience with the tasks being performed. Care was taken not to have any of the senior NCOs evaluate the performance of any of their direct subordinates.

At the beginning of each day (see Table 6), the test administrators met with the senior NCOs who would be assisting with the timing process and evaluating performance levels. The senior NCOs and airmen to be timed were given structured, detailed briefings before beginning the timing trials. Copies of the briefings and instructions are found in Appendix J.

To maximize the number of observations, there were generally two airman being timed at the same time. The core tasks were always performed first, followed by as many non-core tasks as could be measured in the remaining time (up to the two hour limit). To the extent possible, airman performed tasks in a random sequence (within the two categories, core and non-core) to control anxiety and fatigue effects that might occur due to task presentation order. At times, however, the equipment needed by one airman was in use by the other airman being timed; in these cases, the next task in the random order was performed, with the task that was skipped being performed as soon as the equipment was available.

The task timing process began with the airman filling out the identification portion of a Task Timing Form for his or her AFS. The administrator (a member of the research team) then selected the task to be timed and had the airman indicate how frequently he or she had performed the task, using the R-O-N scale on the Task Timing Form. The senior NCO ensured that the required tools and equipment were available, and that the work area was configured in accordance with the description in the Tasks for Timing booklet. The senior NCO then reviewed the "instructions to the administrator" for the task (contained in the booklet), and read the "say to the incumbent" section of the task description which told the airman exactly what task was to be performed. As the airman began performing the task, the administrator started the

stopwatch. Upon completion of the task, the stopwatch was stopped and the elapsed time recorded on the Task Timing Form by the administrator. Using the task steps specified in the Tasks for Timing booklet as a guide, the senior NCO observed the airman's performance, compared it with the five performance levels described at the back of the booklet, and recorded their judgment of quality level on the Task Timing Form. If the airman could not complete the task prior to the cutoff time, he or she was stopped and the cutoff time was recorded on the Task Timing Form, along with a performance level of "1" (Unacceptable). The administrator then selected the next task to be performed and accompanied the airman and senior NCO to the appropriate work station, where the timing process was repeated.

In some cases these procedures had to be modified to accommodate unique situations. Specific timing procedure modifications for each specialty are discussed in Appendix K.

Data Base Design

An important objective of the current effort was to provide a means for future analyses of the measures collected during the field test. To that end, a data base was designed and developed to provide an accurate and complete record of information obtained from participants in the project (SMEs, airmen, supervisors, and evaluators). The data base was designed to record three categories of information: (1) airman data, (2) supervisor data, and (3) task data. Table 7 identifies the source (e.g., Background Information Form, scannable answer sheet) and variables (e.g., Time in Air Force in years and months, MAJCOM code) recorded for airmen. Tables 8 and 9 summarize the information recorded for supervisors and for tasks.

The scannable answer sheets used to collect VOICE, GMS and JKT item responses were optically scanned into the data base; all other data were manually entered into Lotus 1-2-3 spreadsheets using the Data Addition Verification Editing (DAVE) attachment. The DAVE software facilitated data entry by allowing customized data entry screens to be developed which corresponded to the format of the original data collection forms. Further, DAVE provided a data audit capability; boundary conditions were set to detect and correct certain key stroke errors.

After data entry using DAVE, the data on each form were verified against the spreadsheet entries and were corrected where necessary. Verification of the Background Information Forms consisted of checking the names and social security numbers for all forms. All background data was verified for three locations

(Travis, Beale, George AFBs); the number of errors on those forms was less than 0.01 percent, therefore a random sample of 5 percent of the remaining forms were checked. All variables on all of the Time Estimation Forms, Task Timing Forms, as well as information on the tasks, were verified after data entry and corrected where necessary. The data were then converted into three ASCII data bases, one for each category.

Table 7. Airman Data

From Background Information Forms

Name	Grade
SSN	Time in Grade
Time in Air Force	Time in Current Position
AFSC	Supervisor (yes/no)
Time in AFS	Number of Subordinates
MAJCOM	Time as Supervisor in AFS
Location	

From Scannable Answer Sheets

Name	VOICE responses
Location	GMS responses
SSN	JKT responses
AFSC	

From Time Estimation Forms

SSN
How Often You Observe Incumbent Perform Task
Time Estimate
Estimated Productive Capacity (calculated variable)

From Task Timing Forms (only selected airmen)

SSN
Frequency You Perform Task
Time to Perform Task
Performance Level Rating
Order Tasks Were Performed
Airman Cutoff (yes/no)
Actual Productive Capacity (calculated variable)

Table 8. Supervisor Data

From Background Information Forms

Name	Grade
SSN	Time in Grade
Time in Air Force	Time in Current Position
AFSC	Supervisor (yes/no)
Time in AFS	Number of Subordinates
MAJCOM	Time as Supervisor in AFS
Location	

From Supervisor/Airman Lists

Names of Airmen Rated by Supervisor
SSNs of Airmen Rated by Supervisor
Time Supervised Airmen (in months)

The VOICE, GMS and JKT answer sheets were scanned by a National Computer Systems OpScan 5 scanner. Edit checks were programmed into the scanning software to ensure that the location, social security number, and first three characters of the AFSC were complete on all answer sheets. Any answer sheet with one or more of these variables missing had to be corrected by hand before the scanner would read and store the data. Another edit check was designed to flag answer sheets containing multiple responses by airmen to any individual GMS, VOICE, or JKT item. Each item flagged by the scanning software was checked against the answer sheet, and corrected if possible. Otherwise, the multiple response entries were recoded as invalid, using an asterisk (*).

Several calculated variables were added to the airman data base, including the one of primary interest

Table 9. Task Data

SME Workshops (and Field Visits)
Task Numbers
Fastest Benchmark Time
Normal Benchmark Time
Slowest Benchmark Time
Cut-off Time
Field Visits
Modified (yes/no)
Type of Modification (if modified)
Where Modified (if modified)

to this study, productive capacity (PC). There were actually two PC variables - estimated PC and actual PC. Estimated PC was calculated for each task given a time estimate by supervisors, and actual PC was calculated for tasks on which airmen were timed. In addition to PC values, other calculated variables included (for each airman) the six occupational interest composites derived from the 160 VOICE item responses, the three motivation sub-scales derived from the 30 GMS item responses, and an aggregate job knowledge score (percent correct) derived from the JKT item responses--each of the three JKTs had a different number of items (122X0 had 65 items, 454X1 had 75, and 732X0 had 47).

The task data base (Table 9) was designed to provide comprehensive information on both original tasks and modified tasks. A task numbering system was developed to distinguish the two types of tasks. Further, the three benchmark times (fastest, normal, and slowest) and cutoff time (slowest benchmark plus 20 percent) were recorded for each task. For the original tasks, the benchmarks and cutoff times were obtained from information collected during the SME workshops. For the modified tasks, the data entered were based on estimates of benchmark times obtained from senior NCOs during the field test. Additional variables were created to provide a detailed record of the types of modifications to the timed tasks (equipment, instructions, benchmarks) and the location (base) at which specific modified tasks were timed. Table 10 shows the tasks that were modified for each AFS, how the tasks were modified, and the bases where the modified tasks were timed. Note that the data base was designed to identify tasks with multiple modifications. For example, task G262 (455X2) was modified twice (each modification affecting equipment, instructions, and benchmarks). The first modification took place at Beale AFB and was subsequently used at George AFB; the second modification occurred at Davis-Monthan AFB. The original benchmarks and modified benchmarks were recorded in the task data base.

Table 10. Task Modifications

Specialty	Task	Type of Modification	Location(s)
122X0	E199	Equipment, Instruction and Benchmark	George, Holloman, Davis-Monthan and Langley
	I330	Instruction and Benchmark	Offutt
	I349	Equipment and Benchmark	Travis
454X1	F162	Equipment	Davis-Monthan
	I284	Equipment	George, Davis-Monthan and Offutt
	I284	Equipment, Instruction and Benchmark	Holloman and Eglin
455X2	E110	Equipment	Beale and Davis-Monthan
	F169	Equipment and Benchmark	Beale, George, Shaw, Davis-Monthan, Offutt and Eglin
	F199	Equipment	Beale
	F199	Equipment, Instruction and Benchmark	Offutt
	G262	Equipment, Instruction and Benchmark	Beale, George and Davis-Monthan
	G262	Instruction	Shaw
	L398	Equipment	Travis and Langley
	L398	Instruction and Benchmark	Beale, George, Holloman, Davis-Monthan, Langley, Shaw, Offutt and Eglin
732X0	E35	Equipment	All Bases
	E102	Equipment, Instruction, and Benchmark	All Bases

III. COMMENTARY ON METHODOLOGICAL ISSUES

This section provides a discussion of methodological issues relating to the procedures and instruments used in this project. The commentary will be from the perspective of how they might function in an Air Force-wide operational productive capacity data collection effort--as such, the procedures and instruments used in the project for purely construct validation and research purposes (i.e., the VOICE, GMS and JKT

instruments and the hands-on task timing forms and procedures) will not be addressed until the section on recommendations for further research. The commentary addresses the following issues: (1) AFS and task selection, (2) benchmark procedures, and (3) the time estimation process. Each section will include a description of what was done in this study, a discussion of the feasibility of using the procedure operationally, and an identification of concerns and issues.

AFS and Task Selection

The selection of AFSs and tasks to be included in this study was highly constrained by the desire to remain consistent with prior job performance measurement data collection efforts. The selection of AFSs was limited to those previously studied under the JPMS project, of which there were only eight (two from each aptitude area). The added constraint that one AFS be chosen from each aptitude area reduced the selection process to a series of four binary choices. If AFSs were being selected to generate a comprehensive productive capacity data base from which global relationships could be derived between PC and aptitude and experience, obviously different criteria would have to be used. Since it is unlikely that measurement in every AFS will ever be possible, techniques for generalizing relationships from a sample of AFSs must be developed. Some suggestions for generalization techniques will be included in the final section of this report. The generalization technique used would largely dictate the AFS selection strategy.

Task selection within AFSs for this study was also heavily influenced by prior JPMS work. To take advantage of the detailed task analysis and definition previously accomplished, the initial selection of tasks was limited to those for which WTPTs existed. In a much broader-based data collection effort, this restriction would not apply, with all tasks in the master task inventory being candidates for selection. Again, the approach selected to generalize PC relationships from a sample to all AFSs would also dictate the task selection methodology to be used.

We found great variability in the degree to which tasks were standardized across commands and bases--something that is not obvious from data in the master task inventory, since all of the tasks selected for this study came from the top of the "percent members performing" list. Task standardization was generally a function of the equipment being used--obviously the standardization of equipment drives the standardization of the tasks. While the task information routinely collected by the Air Force (frequency

of performance, percent time spent performing, task learning difficulty, etc.) can reasonably be estimated with the rather generic equipment descriptions available in the task inventory, estimates of task performance time would be expected to be very sensitive to the specific equipment configuration used. However, choosing to gather data only on homogeneous tasks may not provide an adequate productive capacity data base, since airmen in most AFSs are rather specialized with regard to the tasks they do.

Selecting tasks for measurement based only on frequency or commonality of performance also ignores the relative importance of tasks to overall mission success. The formulation for PC presented earlier in this study could be modified to include a factor for weighting task-level PC indices into an overall index for an individual. A methodology would be needed for establishing the weights to ensure that individuals are selected to optimize their productivity in the right tasks, not just the most common tasks. Large increases in productivity on tasks that are not on the "critical path" to mission accomplishment may not improve readiness or combat capability as much as smaller improvements in productivity on critical tasks.

Another major issue with task selection is that tasks used for time estimation must be fully developed, described and articulated before SMEs can assign benchmark times or supervisors can estimate performance times for their subordinates. This would be especially true if the time estimates were obtained via a mail-out survey, where no opportunity exists to discuss and standardize the task descriptions. Fully-developed tasks must include information about exactly what equipment is being used and what state it is in at the beginning of the task, at what point task performance begins and ends, and some idea of the criterion used for acceptable performance. During the discussions of the tasks at the benchmark estimation workshops, each SME had his or her own idea about each of these aspects of task performance. The tasks, as they appear in the master task inventories from OMS, are clearly not suitable for use in estimating performance times without some additional description.

Benchmark Development Procedures

While the procedures used in the benchmark time estimation workshops worked well, the cost of such workshops to routinely establish benchmark times for large numbers of AFSs and tasks would clearly be prohibitive. The issue discussed above relating to task description caused most of the difficulty in the workshops. If future workshops are used to establish benchmark times, the SMEs should be given a set of fully-developed tasks with which to start time estimation and discussion. After discussion of the tasks,

so that every person is clear about the meaning of the constraints, the SMEs should be more capable of assigning accurate time estimates.

Although extremely time consuming, the modified NGT process worked well with the groups of SMEs, always producing consensus among the members. The process is slow because of the large number of tasks involved and the requirement for three separate benchmark times for each task (fastest, normal and slowest performance times), which necessitated hundreds of iterations through the process of presenting and explaining each of the independent estimates, revising the estimates and finally voting on the most frequent values to reach consensus.

A word of caution is in order if workshops like these are used in the future. In the interest of expediency, the SMEs for this effort were selected from only a few bases, generally in the San Antonio, Texas area. Unfortunately, since Air Force NCOs tend to be very competitive, this appeared to have created an environment in which SMEs from the same base seemed to informally conspire to estimate lower performance times to make personnel at their base appear more proficient than at the other bases. A wider sampling of bases for SME selection (preferably with only one SME per base) might reduce the competitive tendency. Of course, if future benchmarks are established via a mail-out survey, this problem would be avoided.

Time Estimation Process

The ability of supervisors to accurately estimate their subordinates' performance times on specific tasks will also be a major analytic issue with the data collected in this study. The effect of the level of task description detail on estimation accuracy can also be determined through analysis. Procedurally, the approach used to solicit supervisor estimates in this study worked quite well, although it would not be practical for any large-scale application. Setting up group supervisor time estimating sessions at each base was a non-trivial task. One difficult problem involved getting accurate and current lists of supervisors and their subordinates, since this information changes frequently and only exists at base level (it is not in the master files at AFMPC).

Another practical problem involved assembling all supervisors in one location at the same time. Shift work, leave and TDY (temporary duty) schedules, mission requirements, and availability of suitable space

all made scheduling the group sessions problematic. Again, the process could be greatly simplified using a mail-out survey approach to solicit supervisor estimates, although standardizing the estimation process would be more difficult in a survey mode; for instance, it would not be possible to ensure that supervisors rated each subordinate against all tasks before moving on to the next subordinate, as was done in the group sessions. The need to match supervisors and subordinates ahead of time in this study was driven by the research nature of the effort (i.e., administration of VOICE, GMS, JKTs and hands-on timing tests to the subordinates to validate the supervisors' estimates). In an operational system supervisors could simply be sent a task booklet and time estimation forms and be asked to identify (name and SSAN) all of their current subordinates and provide time estimates for each.

Another procedural issue came up early in the study, relating to the way in which benchmark times are presented to supervisors on the data collection instruments. The initial strategy was to just include the times (fastest, normal and slowest) from the SME workshops in the Tasks for Time Estimation booklets presented to the supervisors. However, after preparing the booklets, it appeared that the benchmark times might get "lost" in the descriptive material and might not serve their intended purpose of keeping the time estimates within reasonable bounds. To correct this deficiency, the benchmark times were printed on the Time Estimation Forms for the pilot test at Andrews AFB. Unfortunately, some supervisors interpreted the three benchmark times as the only allowable responses for each task, like a multiple-choice test. Several scales and graphic depictions were developed to reach a compromise between these two approaches. The open-ended time-line approach (see Figure 1) seemed to work the best.

IV. RECOMMENDATIONS

Initial Analysis Needs

The data collected in this study were intended to help answer a wide variety of questions related to the measurement of productive capacity and its suitability as an Air Force personnel planning and management tool. The data base produced from the research is extremely rich and complex and should support many future analytical studies. The following are some of the key questions that should be answered before proceeding with any additional data collection or procedural development efforts:

Is there variability in PC across airmen? Air Force enlisted personnel are selected, classified and trained through a rigorous process of highly standardized testing and instruction. A key question that must be answered before proceeding with this effort is how much variability in task performance times (and, thus, PC) remain among individuals who have been through this "leveling" process. If all airmen in an AFS perform the same tasks at essentially the same rate, PC will have little value as a discriminator. That is, low variability in actual task performance times would suggest that PC, as measured in the current project, may not be a useful construct for personnel planning and management.

Is PC a valid measure of job performance? While PC has an intuitive appeal as a useful performance measure, its relationship to other, more established, performance measures has yet to be determined. This fundamental question can be addressed by examining the relationships between mean PC values computed for each airman and the two other performance measures collected on each airman, i.e., the overall productivity rating provided by the airman's supervisor, and the JKT score achieved by the airman (AFSs 122X0, 454X1 and 732X0 only). This analysis should be conducted using both estimated task performance times and actual task performance times to calculate mean PC values for the airmen--obviously, the sample sizes will be much smaller for the actual task performance time case. Correlational analyses of the measures will help establish the construct validity of PC as a performance metric.

How well can supervisors estimate task performance times for their subordinates? Even if there were variability in PC and it proved to be a valid performance construct, its utility as a personnel management tool will be severely limited unless there were an inexpensive way to measure it. This issue can be addressed through a variety of analyses using the data collected in this study. At the most fundamental level, the association between estimated and actual performance times can be examined at the task, AFS and total sample levels. If the relationships are not moderately strong and in the expected positive direction, a method other than supervisor estimation may have to be found to collect PC data. Additional analyses should control for potential effects due to the frequency with which supervisors had previously observed airmen performing the tasks, using responses to the frequency scale (regularly, occasionally, never) on the Time Estimation Form. Controlling for supervisor experience (from the background information collected on the supervisors) could also help develop supervisor selection criteria for future studies (e.g., do more experienced supervisors make better estimates?). Higher level analyses can also be accomplished using calculated mean PC values, determined from both estimated and actual performance times.

How well can SMEs set benchmark performance times? To help supervisors estimate task performance times for their subordinates, they need some prior information regarding the range of times typically required for each task. In this study the benchmark times were generated at SME workshops. Analyses can be conducted at the AFS and total sample level comparing the benchmark fastest, normal and slowest times with the actual observed minimum, mean and maximum performance times for each task on which time measurements were taken. This analysis will help indicate whether SME-generated benchmark times are accurate enough to guide supervisors in estimating performance times for their subordinates. The analysis of fastest time benchmarks (versus minimum measured times) will be especially critical, since the fastest time benchmarks are proposed for use as the T* value in computing PC values. If results indicate that some observed or supervisor estimated times are smaller than the benchmark fastest times, using the benchmarks to compute PC values may have to be reevaluated.

Is PC predictable from available personnel information? Even if PC did vary across airmen, was a valid measure of job performance, and was measurable in some cost-effective manner, it would not be useful for selection, classification or retention planning and management unless it was predictable from some set of individual and job characteristics. Modeling the relationship between PC and individual characteristics such as aptitude (ASVAB sub-test scores or composites from the personnel files), experience (from the background information collected on each airman), motivation (from the GMS), interest (from VOICE), and job characteristics (such as aptitude area) would begin establishing the basis for using PC as a selection, classification and force management tool.

Alternative Strategies for Productive Capacity Measurement

If the analyses identified above confirm that PC, using supervisor estimates of task performance time, has potential as a criterion for personnel planning and management, the next step in the research process should be aimed at moving the technology closer to an operational system. A logical move in this direction would be an attempt to collect supervisor estimates of task performance times using a mail-out survey rather than group sessions. In this way, much larger samples could be obtained at considerably lower costs. The issue relating to the importance of benchmark times in obtaining accurate and reliable supervisor estimates could be addressed by including benchmarks on some of the surveys and not on others. The issue of how much task description detail is needed could also be addressed by varying the amount of detail provided to the supervisors.

Prior to developing the survey, tasks would have to be selected, described in detail and benchmark times established. Rather than repeating the procedure used in this study of first selecting representative AFSs and then selecting representative tasks from each AFS, an alternative approach might be considered that could facilitate the generalization process. In a recent study, Lance and Mayfield (1989) developed and validated a 26 item standard Air Force enlisted specialty task taxonomy. If tasks were selected and data collected by task category, cutting across a variety of AFSs, it might be possible to model the relationship between PC and individual characteristics for each of the 26 categories. Weighted combinations of the task category relationships could then be used to create PC relationships for each AFS, with the weights derived from an analysis of the relative time spent (RTS) on each of the task categories by airmen in each AFS.

In an operational system, the RTS distributions would have to be periodically updated and revalidated (possibly as part of the routine OMS survey process) as AFSs change over time. An added benefit of this approach is that productivity curves could also be estimated for new weapon-system driven AFSs by estimating the RTS distributions for the new AFSs to weight the 26 task category productivity functions.

Once tasks are selected for analysis from the master job inventories, some process would have to be used to describe them in more detail. This would probably require convening small groups of SMEs (3 or 4) for a few hours to review the tasks and provide a set of conditions, assumptions and equipment configurations for each. The fully described tasks could then be sent out to a larger group of SMEs with instructions for estimating benchmark performance times--the independent estimates could then be averaged to arrive at the benchmarks. The increased use of surveys to collect performance time estimates will require careful attention to the instructions provided and the format of the materials sent out to minimize misunderstandings and errors.

Implications for the Use of Productive Capacity in Personnel Planning

This study clearly demonstrated that collecting PC information on a large-scale basis is an extremely complex and time-consuming task. Numerous administrative and logistical problems were encountered in selecting and preparing tasks for analysis, in establishing benchmark performance times for each task, in identifying and assembling supervisors and airmen for data collection, and especially in timing actual task performance in an operational environment. However, a primary purpose of the effort was to identify

these problems so they might be avoided in future work. Also, a secondary purpose was to collect extra data (interest and motivation measures, job knowledge scores and actual performance times) to validate the use of PC in personnel management, something that would not be required in routine operational use.

In spite of the complexity and difficulties encountered, nothing was found from a procedural or instrumentation standpoint that would preclude the development and use of a productivity-based personnel planning and management system for the Air Force. The development of such a system is, of course, contingent on positive results from the analyses identified above and on successful follow-on research to refine the data collection procedures. Analytical techniques must also be developed and validated for using PC relationships to set minimum enlistment and classification standards, to allocate new recruits to jobs, and to set reenlistment objectives that will yield the highest level of productivity per personnel dollar spent.

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APPENDIX A

Supervisor-Airman List

SUPERVISOR-AIRMEN LIST

Supervisor Name _____
Last First Middle Initial

SSN _____

Grade _____

AFS _____

Location (Beale AFB, etc.) _____

Airmen

Name (Last, First, Middle Initial)	SSN	Grade	How many months have you supervised this airman?
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

APPENDIX B

Background Information Form

BACKGROUND INFORMATION FORM

Name _____
Last First Middle Initial

SSN _____

Time in Air Force ____years ____months

Air Force Specialty (AFS) Code _____ Time in AFS ____years ____months

MAJCOM (TAC, MAC, etc.) _____ Are you in the Reserves? yes __ no __

Location (Beale AFB, etc.) _____

Grade _____ Time in Grade ____years ____months

Title of Current Position _____

Time in Current Position ____years ____months

Are you a supervisor? yes ___ no ___ If yes, number of subordinates _____

Total time as a supervisor in this AFS ____years ____months

PRIVACY ACT STATEMENT

In accordance with AFR 12-35 paragraph 8, the following information is provided as required by the Privacy Act of 1974.

AUTHORITY: AFR 169-3, Using Human Subjects in Research, Development, Test and Evaluation; 10 U.S.C. 8012, Secretary of the Air Force, Power and Duties, Delegation by Executive Order 9397, 22 November 1943.

PURPOSE: To collect information from incumbents of the Aerospace Ground Equipment (AGE) (454X1), Personnel (732X0), Aircrew Life Support (122X0), and Avionic Communication and Navigation Systems (455X2) Specialties regarding task performance. Some incumbents will complete the Vocational Interests for Career Enhancement (VOICE), the General Scale, and a Job Knowledge Test (JKT).

ROUTINE USE: The information to be collected in this field visit supports Air Force research to improve its selection and classification process. The information is for research purposes only and will not become part of any participant's permanent personnel record nor will it affect any participant's opportunity for promotion, assignment or retention.

PARTICIPATION: Your participation in this project and furnishing of your Social Security Number (SSN) is voluntary. However, your cooperation in this effort is vitally important in helping to ensure that future Air Force members are properly selected, trained and placed in the right job. Your SSN is essential for matching information in Air Force personnel files and conducting meaningful analyses. Failure to provide it could render your other information unusable.

APPENDIX C

Tasks for Time Estimation Booklet

Figure C-1. Instructions to Supervisor on Task Time Estimation

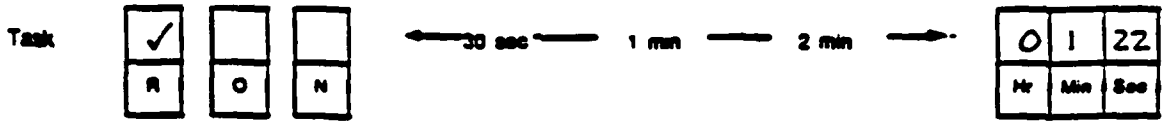
INSTRUCTIONS

The first column of the time estimation form is a list of task numbers. These task numbers correspond to the task numbers in your task booklets. The task numbers on the form and the task booklets are in the same order. The next set of columns asks you to tell us how often you have observed your airmen doing each of the tasks. You provide this information by checking the box above the "R", "O" or "N" for each task. "R" means you regularly see him (or her) do the task. "O" means you have seen him do the task occasionally, and "N" means you have never seen him do the task.

The next section presents a time line with three time estimates. "Fastest" refers to the fastest this task could be done and still meet the accepted level of performance. "Normal" refers to the ordinary time the average airman needs to do this task to the accepted level of performance. "Slowest" refers to the longest amount of time that could be allowed for performance of this task without negative consequences to the job. These times were provided by six NCOs from your career field. These are provided for your information only and should not limit the estimates you make for your airmen. If you think one of your airmen could do a task faster than the "fastest" time provided, please put down what you think. If you think one of your airmen would take longer than the "slowest" time, put that down as well. Or if you estimate that your airman may perform more quickly or slowly than the "normal" time, record that time. You are free to record <u>any</u> time you think appropriate for your airmen on each task.

The last column on this form is where you record your estimate of how long each of your airmen would take to do each of the tasks. Record your time in hours, minutes, and seconds, writing in the appropriate number in the boxes above "Hr", "Min", and "Sec". If you have never seen one of your airman perform a task, please give your best estimate of how long it would take him or her. Base your estimate on your knowledge of his or her performance on similar tasks in your specialty.

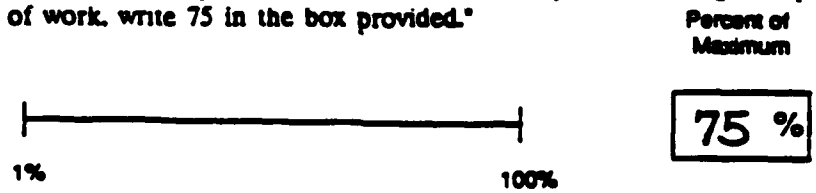
As an example, think about the task of "Starting a Car." Assume that you are estimating how long it would take an airman to start a motor pool car and that the airman has to check all mirrors, gauges, and seat/steering wheel positions. Look at the completed time estimation example below. The box above "R" was checked since you have regularly observed the person perform the task. The time estimates provided to you are 30 seconds for the fastest time, 1 minute for the normal time, and 2 minutes for the slowest time. You think about the particular airman you are rating and decide that he takes a little longer than the normal time, but not as long as the slow time and decide to give him 1 minute and 22 seconds as the time estimate. Therefore, you would put a "0" for zero hours in the Hr box, a "1" for 1 minute in the Min box, and a "22" for 22 seconds in the Sec box. Are there any questions?



We are also asking you to give an overall judgement about each airman regarding the relative amount of acceptable work they can perform in a typical day. This rating scale is presented on the last page of your time estimation form. The question is worded:

> In your specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.

Look at the example below. Assume that 100% is the maximum amount of work that can be done and 1% is the least amount of work. If you believe that the airman you are rating can perform 75% of the maximum amount of work, write 75 in the box provided.



In making your estimates, please think about how long it would take each airman to do each task if he or she were working as quickly as they could, while <u>maintaining satisfactory performance</u>. The key words here are working <u>quickly</u> and <u>satisfactory</u> performance.

Figure C-2. Examples of WTPT Tasks (AFS 122X0, Aircrew Life Support)

Task E199

Make entries on AFTO Form 152 (chemical ensemble inspection record)

Consensus Time Estimates: Fast - 2 mins. 30 secs. Normal - 4 mins. Slow - 7 mins.

Tools and Equipment: T.O. 14P3-1-131, T.O. 14P4-1-151, pen, pencil, blank preprinted AFTO Form 152, bag containing the aircrew chemical ensemble items, tape, completed 1574.

Background: The different commands use different equipment so the equipment listed on the AFTO Form 152 should be assembled prior to testing. Another reason to have the items gathered before testing is that some bases will not have individual kits already assembled.

Configuration: A bag containing the aircrew ensemble items listed on the AFTO Form 152, and the completed AFTO Form 1574 for this bag. Assume the bag contains one of each item in estimating times to perform.

Instructions to the administrator: Incumbents may not be familiar with all the items in the bag. However, there is a space for each item on the AFTO Form 152. A number of the spaces on the 152 will not be able to be filled in by simply inventorying the bag. The bag is to include the following general item: tape. It will be necessary for you to complete the 1574 for the bag prior to administering this item. You will give the AFTO Form 1574 to the incumbent.

SAY TO THE INCUMBENT

Maj John Smith of the 7th ARS just came in off alert and you need to inventory the chemical ensemble bag and complete a new AFTO Form 152. I know a number of blank spaces cannot be filled in by inventorying the bag but fill in all spaces you are able to complete. Assume that the "O" ring was replaced when the filter was replaced. Here is the AFTO Form 1574 for this bag. This task was developed in reference to T.O. 14P3-1-131 and T.O. 14P4-1-151. Tell me when you are ready to begin.

Steps:

1. Fill in the aircrew member's name

2. Fill in the filter pack serial number (will vary, information on filter pack)

3. Fill in the serial number for the mask

4. Fill in the filter lot number (will vary, information on AFTO Form 1574 and/or filter pack)

Task E199 (continued)

5. Fill in the date of installation for the filter (will vary, information on AFTO Form 1574 and/or on filter pack)

6. Fill in the date the "O" ring was replaced (same date as the filter pack)

7. Fill in the date tape replaced (will vary, information on AFTO Form 1574 and/or on filter pack)

Fill in the quantity on hand (assume time to count one of each) for:

8. Filter pack assembly

9. Extra filter elements

10. Suspension assembly

11. Mask CBO, MBU-13/P

12. Hood, HGU-41/P

13. Drawers, cotton

14. Undershirts, cotton

15. Gloves, cotton

16. Gloves, butyl or neoprene

17. Undercoveralls

18. Footcovers; plastic

19. Capes

Fill in the size for:

20. Drawers, cotton (will vary)

21. Undershirts, cotton (will vary)

22. Undercoveralls (will vary)

Task H295

Fit the 55/P helmet using a custom liner

Consensus Time Estimates: Fast - 4 mins. Normal - 6 mins. Slow - 10 mins.

Tools and Equipment: T.O. 14P3-4-151, 55/P helmet shell (with liner), scissors, matches, pencil, earcups, earcup pads, bayonet, bayonet spacer, bayonet receiver, 12/P or 5/P oxygen mask.

Background: Actual fitting of the helmet depends on personal preference of the wearer. It also involves actual drilling of holes in the helmet shell.

Configuration: HGU-55/P helmet shell without receivers but with liner and communication system installed, and with nape strap untied.

Instructions to the Administrator: Administer at any workstation. A person needs to be available for this task.

SAY TO THE INCUMBENT

I want you to perform the step-by-step procedures that are followed when you fit the 55/P helmet. The helmet liner has already been placed in the shell. Stop immediately prior to drilling the holes. This task was developed in reference to T.O. 14P3-4-151. Tell me when you are ready to begin.

Steps:

1. Have the user don the helmet
2. Have user rotate the earcups so that the ears fit into and are completely surrounded by the earseals
3. Lace and adjust the helmet nape strap by tightening the lacing cord and securing it with a square knot
4. Insert each bayonet into helmet receiver to the fourth locking position
5. Place a spacer underneath each helmet receiver
6. Locate each helmet receiver no closer to the edge of the helmet shell than 1/2 inch
7. Trace lightly around each spacer with a pencil
8. Mark the screw holes with a pencil or sharp instrument

Task H295 (continued)

9. Have user doff helmet

10. Pull fabric inside helmet shell away from the drilling area

Figure C-3. Examples of Non-WTPT Tasks (AFS 122X0, Aircrew Life Support)

Task E203

Make entries on AFTO Forms 335 (Anti-g suit inspection data)

Consensus Time Estimates: Fast - 10 secs. Normal - 12 secs. Slow - 15 secs.

Task E206

Make entries on AFTO Forms 338 (Survival kit record)

Consensus Time Estimates: Fast - 2 mins. Normal - 3 mins. Slow - 4 mins.

Assumptions: Preprinted form
Transcribe from an old form to a new form

Task E209

Make entries on AFTO Forms 391 (Parachute log)

Consensus Time Estimates: Fast - 3 mins. Normal - 4 mins. Slow - 5 mins.

Assumptions: This form is not preprinted
Transcribing from an old form to a new form

Task E212

Make entries on AFTO Forms 406 (Mesh net survival test inspection record)

Consensus Time Estimates: Fast - 1 min. Normal - 2 mins. Slow - 3 mins.

Assumptions: Preprinted form
Transcribe from an old form to a new form

Task E213

Make entries of AFTO Forms 334 (Helmet oxygen mask and connector inspection record)

Consensus Time Estimates: Fast - 30 secs. Normal - 45 secs. Slow - 1 min.

Assumptions: Preprinted form
Transcribe from an old form to a new form

Figure C-3. Examples of Nm-WTPT Tasks (AFS 122X0, Aircrew Life Support)

APPENDIX D

Time Estimation Forms

AIRCREW LIFE SUPPORT SPECIALIST

AFS 122X0

Name _____

Airman's Name _____ Airman's SSN _____

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
E199				2 min 30 sec	4 min	7 min			
H295				4 min	6 min	10 min			
H303				10 min	13 min	17 min			
H315				2 min	2 min 45 sec	4 min			
H320				1 min	2 min	3 min			
I330				3 min 30 sec	4 min	5 min			
I349				7 min	10 min	15 min			
J380				13 min	17 min	22 min			

R = Regularly
O = Occasionally
N = Never

Hr = Hours
Min = Minutes
Sec = Seconds

	How Often You Observe Incumbent Perform Task (Check one box below)	Fastest	Normal	Slowest	What is Incumbent's Performance Time? (Fill in box below)
		Consensus Performance Time Scale			
J383	R O N	2 min 30 sec	4 min	5 min 30 sec	Hr Min Sec
K389	R O N	1 min 30 sec	3 min	4 min	Hr Min Sec
K398	R O N	15 min	20 min	25 min	Hr Min Sec
E203	R O N	10 sec	12 sec	15 sec	Hr Min Sec
E206	R O N	2 min	3 min	4 min	Hr Min Sec
E209	R O N	3 min	4 min	5 min	Hr Min Sec
E212	R O N	1 min	2 min	3 min	Hr Min Sec
E213	R O N	30 sec	45 sec	1 min	Hr Min Sec
F242	R O N	1 min	2 min	3 min	Hr Min Sec
F243	R O N	40 sec	1 min	1 min 30 sec	Hr Min Sec

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
F257				3 min	5 min	7 min			
F258				45 sec	1 min 30 sec	2 min			
F260				30 sec	1 min	2 min			
F261				3 sec	5 sec	7 sec			
H287				20 min	30 min	40 min			
H297				30 sec	1 min	2 min			
H311A				15 min	20 min	30 min			
H311B				15 min	20 min	30 min			
H319				5 min	7 min	10 min			
H325				2 min 30 sec	3 min 30 sec	5 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
H326				10 sec	30 sec	1 min			
H327				10 sec	15 sec	20 sec			
I336				6 min	10 min	15 min			
I339				45 sec	1 min 30 sec	2 min 30 sec			
I341				8 min	15 min	25 min			
I346				3 min	4 min 30 sec	7 min			
I347				45 sec	1 min	1 min 30 sec			
I354				7 min	13 min	20 min			
I366				3 min	5 min	8 min			
I370				3 min 30 sec	7 min 30 sec	10 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
J379				9 min	12 min	15 min			
K390				1 min 30 sec	3 min	4 min 30 sec			
M483				15 min	20 min	30 min			
M484				2 min	3 min	4 min			
N492				36 sec	1 min	2 min			
N493				30 sec	1 min 15 sec	2 min 30 sec			
N499				7 min 30 sec	12 min	20 min			

In this specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.

1% ——— 100%

Percent of Maximum

%

AEROSPACE GROUND EQUIPMENT (AGE) SPECIALIST

AFS 454X1

Name _____

Airman's Name _____ Airman's SSN _____

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
E120				8 min	13 min	21 min			
F154				11 min	17 min	24 min			
F155				9 min	15 min	23 min			
F162				15 min	23 min	33 min			
G179				48 min	1 hr 13 min	1 hr 39 min			
H209				20 min	31 min	47 min			
H215				13 min	19 min	29 min			
H238				17 min	25 min	36 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent *Perform* Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
I251				31 min	47 min	1 hr 7 min			
I255				1 hr 43 min	2 hr 30 min	3 hr 25 min			
I260				14 min	24 min	33 min			
I264				43 min	1 hr	1 hr 24 min			
I275				33 min	51 min	1 hr 13 min			
I284				14 min	23 min	34 min			
I286				38 min	58 min	1 hr 23 min			
I300				15 min	22 min	33 min			
J332				1 hr 32 min	2 hr 11 min	3 hr			
J340				23 min	34 min	50 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
L421				18 min	35 min	49 min			
M446				30 min	45 min	1 hr 3 min			
N477				26 min	39 min	54 min			
N488				38 min	55 min	1 hr 18 min			
N503				9 min	18 min	28 min			
P549				10 min	15 min	23 min			
P555				28 min	40 min	58 min			
E143				7 min	12 min	16 min			
F153				10 min	15 min	20 min			
F157				10 min	15 min	20 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
G171				30 min	45 min	1 hr 5 min			
G181				1 hr 30 min	2 hr 30 min	4 hr			
H202				4 min	6 min	10 min			
H203				10 min	15 min	25 min			
H236				5 min	15 min	30 min			
H237				5 min	10 min	20 min			
I247				5 min	10 min	15 min			
I248				7 min	12 min	17 min			
I283				30 min	45 min	1 hr			
I299				1 hr 30 min	2 hr	2 hr 30 min			

R = Regularly
O = Occasionally
N = Never

Hr = Hours
Min = Minutes
Sec = Seconds

	How Often You Observe Incumben Perform Task (Check one box below)	Consensus Performance Time Scale: Fastest	Normal	Slowest	What is Incumbent's Performance Time? (Fill in box below)
J347	R O N	30 min	45 min	1 hr 20 min	Hr Min Sec
J355	R O N	25 min	40 min	1 hr	Hr Min Sec
L406	R O N	12 min	30 min	45 min	Hr Min Sec
L436	R O N	15 min	25 min	35 min	Hr Min Sec
L437	R O N	5 min	10 min	15 min	Hr Min Sec
M444	R O N	30 min	1 hr	1 hr 30 min	Hr Min Sec
M447	R O N	10 min	20 min	30 min	Hr Min Sec
N475	R O N	15 min	20 min	30 min	Hr Min Sec
N486	R O N	1 hr	1 hr 20 min	1 hr 45 min	Hr Min Sec
N487	R O N	20 min	30 min	45 min	Hr Min Sec

R = Regularly
O = Occasionally
N = Never

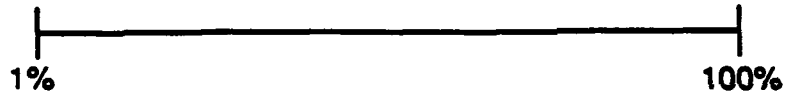
How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

		Fastest	Normal	Slowest	
N494	R O N	7 min	15 min	20 min	Hr Min Sec
P554	R O N	16 min	17 min	20 min	Hr Min Sec

In this specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.



Percent of Maximum

%

AVIONIC COMMUNICATION AND NAVIGATION SYSTEMS SPECIALIST

AFS 455X2

Name _____

Airman's Name _____ Airman's SSN _____

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

		Fastest	Normal	Slowest	
E110	R O N	10 min	15 min	20 min	Hr Min Sec
E138	R O N	2 min	4 min	6 min	Hr Min Sec
E140	R O N	8 min	10 min	12 min	Hr Min Sec
F169	R O N	15 min	25 min	30 min	Hr Min Sec
F196	R O N	12 min	17 min	22 min	Hr Min Sec
F199	R O N	3 min	5 min	7 min	Hr Min Sec
F200	R O N	3 min	5 min	7 min	Hr Min Sec
F206	R O N	5 min	10 min	15 min	Hr Min Sec

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
G218				30 min	1 hr	1 hr 30 min			
G227C				40 min	1 hr	1 hr 30 min			
G232				40 min	55 min	1 hr 10 min			
G250				8 min	12 min	15 min			
G252				6 min	10 min	15 min			
G262				4 min	6 min	8 min			
L398				7 min	10 min	15 min			
E109				1 min	2 min	3 min			
E139C				2 min	3 min	6 min			
E139N				1 min	2 min	3 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
F164				5 min	10 min	15 min			
F167				20 min	30 min	40 min			
F185				6 min	8 min	12 min			
F187				1 hr 30 min	2 hr	3 hr			
F202				2 min	4 min	7 min			
F209				10 min	15 min	20 min			
G208				5 min	10 min	12 min			
G215				4 min	8 min	12 min			
G222				5 min	10 min	12 min			
G226				30 min	1 hr	1 hr 30 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus *Performance Time Scale*

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
G227N				5 min	10 min	20 min			
G229				1 min	3 min	5 min			
G236				5 min	10 min	15 min			
G239				23 min	30 min	40 min			
G256				2 min	4 min	6 min			
G258				7 min	10 min	15 min			
G259				5 min	8 min	15 min			
I302				5 min	10 min	15 min			
L404				4 min	6 min	8 min			
L407				3 min	5 min	10 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
M461				3 min	6 min	10 min			
M483				8 min	10 min	20 min			
U971				9 min	12 min	18 min			

In this specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.

1% ——— 100%

Percent of Maximum

%

PERSONNEL SPECIALIST

AFS 732X0

Name _____

Airman's Name _____ Airman's SSN _____

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
E35				7 min	10 min	12 min			
E102				30 sec	1 min	1 min 30 sec			
E107				3 sec	15 sec	30 sec			
E114				1 min	2 min	3 min			
F140				45 sec	1 min 30 sec	2 min			
L733				2 min	3 min	5 min			
O826				7 min	10 min	15 min			
R1011				45 sec	1 min	2 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Fastest — Normal — Slowest

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
A4				2 min	4 min	6 min			
A10				3 min	5 min	10 min			
A19				1 hr	1 hr 30 min	2 hr			
B30				5 min	9 min	15 min			
B37				5 min	10 min	20 min			
B38				50 hr	102 hr	176 hr			
B41				45 min	1 hr	1 hr 30 min			
B44				5 min	10 min	15 min			
E95				3 min	5 min	9 min			
E97				10 min	15 min	20 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Fastest — Normal — Slowest

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	Fastest	Normal	Slowest	Hr	Min	Sec
E103				30 sec	45 sec	1 min			
E108				3 min	5 min	15 min			
E130				8 min	10 min	20 min			
E131				3 min	5 min	10 min			
E134				*2 min*	*3 min*	*5 min*			
E136				3 min	5 min	7 min			
E142				2 min	5 min	10 min			
F172				5 min	10 min	15 min			
F212				3 min	6 min	10 min			
L609				1 min	2 min	3 min			

R = Regularly
O = Occasionally
N = Never

How Often You Observe Incumbent Perform Task (Check one box below)

Consensus Performance Time Scale

Hr = Hours
Min = Minutes
Sec = Seconds

What is Incumbent's Performance Time? (Fill in box below)

	R	O	N	← Fastest	Normal	Slowest →	Hr	Min	Sec
O850				15 min	18 min	20 min			
Z1452				3 min	4 min	5 min			
Z1466				2 min	3 min	4 min			
Z1494A				5 min	7 min	15 min			
Z1494B				5 min	7 min	15 min			
Z1495				2 min	3 min	5 min			
Z1511				2 min	4 min	7 min			
Z1533				15 min	20 min	30 min			

In this specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.

1% ——— 100%

Percent of Maximum

%

APPENDIX E

Generalized Motivation Scale (GMS)

GENERAL SCALE

Instructions

To familiarize yourself with this questionnaire, it would be useful to scan it quickly before answering any of the items. It is a good idea to work rather fast and to give your first reaction to each item. Some of the statements may seem alike to you, but all of them are necessary to show slight differences of opinion. Because your opinion is being asked for, there are no right or wrong answers. Also, keep in mind that the responses to this questionnaire are being kept confidential, so answer items as honestly as you can.

Please do not make any marks in this booklet. You should record your answers on Part 2 - General Scale, located on Side 2 of the separate answer sheet. Mark the circle on your answer sheet that corresponds with your opinion using the following scale:

Blacken the circle marked "A" if you **strongly disagree** with the statement.

Blacken the circle marked "B" if you **disagree** with the statement.

Blacken the circle marked "C" if you **slightly disagree** with the statement.

Blacken the circle marked "D" if you **neither agree nor disagree** with the statement.

Blacken the circle marked "E" if you **slightly agree** with the statement.

Blacken the circle marked "F" if you **agree** with the statement.

Blacken the circle marked "G" if you **strongly agree** with the statement.

The scale is printed at the top of the following two pages for reference. When you are told to begin, read through the questionnaire items one at a time and begin recording your answers on the "General Scale" section on the answer sheet.

Please use the following scale when responding to each item:

A	B	C	D	E	F	G
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

1. When faced with a difficult problem, I am a less persistent worker than my peers.
2. If I fail at something, it's because I did not make plans in advance.
3. Others tend to evaluate me as being competent in most areas.
4. Someone usually has to tell me what to do.
5. Setting goals is not important for success.
6. Failure makes me quit what I am doing to try something entirely different.
7. When someone tells me that I did a good job, it's because I did do a good job.
8. When I work on a long task, I have difficulty finishing it successfully.
9. It is important to set goals in order to be successful.
10. If something looks too complicated, I will not bother to try it.
11. When I evaluate my performance in general, I find it to be superior.
12. I like working on problems that I know I can solve better than trying problems that are new to me.
13. It is not necessary to make plans in order to succeed.
14. I rarely achieve goals that I have set for myself.
15. When I make plans to solve problems, I am certain to make them work.
16. I can work at something for a very long time if necessary in order to finish it.
17. I have to set goals before starting a project.
18. On the whole, I am more competent than my peers.

Please use the following scale when responding to each item:

A	B	C	D	E	F	G
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

19. Failure does not spur me on to try new and better solutions to a problem.

20. I feel that I need to be capable at my job in order to be successful.

21. Others tend to evaluate me as being very competent.

22. Most of the time, I do not expect to be successful.

23. I believe that it is important to finish a job, even if it is not challenging to me.

24. I expect to be successful most of the time.

25. I admire people who try to learn something new everyday.

26. I usually do not feel very competent when attempting very difficult problems.

27. Setting goals is not important to me.

28. I am usually successful when I strive to accomplish a goal.

29. I believe that learning new things can help me perform better.

30. I cannot work at something difficult for a very long time even if it is necessary in order to finish it.

APPENDIX F

Task Timing Forms

TIMING FORM - AIRCREW LIFE SUPPORT (AFS 122X0)

Examinee Name _____ SSN _____
Last First Middle Initial

Grade _____ AFS _____ Location (AFB)_____

Task E199 Make entries on AFTO Form 152 (chemical ensemble inspection record

R O N

Time: ___ . ___ . ____ Cut off: 8 mins. 24 secs. Rating: 1 2 3 4 5

Task H295 Fit the 55/P helmet using a custom liner

R O N

Time: ___ . ___ . ____ Cut off: 12 minutes Rating: 1 2 3 4 5

Task H303 Perform a 30 day inspection on an HGU-55/P helmet

R O N

Time: ___ . ___ . ____ Cut off: 20 mins. 24 secs. Rating: 1 2 3 4 5

Task H315 Replace the nape strap and pad

R O N

Time: ___ . ___ . ____ Cut off: 4 mins. 48 secs. Rating: 1 2 3 4 5

Task H320 Remove and replace headsets in helmet

R O N

Time: ___ . ___ . ____ Cut off: 3 mins. 36 secs. Rating: 1 2 3 4 5

Task I330 Size and fit oxygen masks

R O N

Time: ___ . ___ . ____ Cut off: 6 minutes Rating: 1 2 3 4 5

Task I349 Perform oxygen mask periodic inspections

R O N

Time: ___ . ___ . ____ Cut off: 18 minutes Rating: 1 2 3 4 5

Task J380 Remove and Install the filter elements in the CRU-80/P

R O N

Time: ___ . ___ . ____ Cut off: 26 mins. 24 secs. Rating: 1 2 3 4 5

Task J383 Perform the mask exchange in the vapor hazard area

R O N

Time: ___ . ___ . ____ Cut off: 6 mins. 36 secs. Rating: 1 2 3 4 5

Task K389 Fit and adjust a parachute harness

R O N

Time: ___ . ___ . ____ Cut off: 4 mins. 48 secs. Rating: 1 2 3 4 5

Task K398 Perform 30 day routine parachute inspection

R O N

Time: ___ . ___ . ____ Cut off: 30 minutes Rating: 1 2 3 4 5

TIMING FORM - AEROSPACE GROUND EQUIPMENT (AFS 454X1)

Examinee Name _____ _____ SSN _____
Last First Middle Initial

Grade _____ AFS _____ Location (AFB)_____

Task F154 Perform an aircraft support generator service inspection

R O N

Time: ___ . ___ . ____ Cut off: 29 mins. 2 secs. Rating: 1 2 3 4 5

Task F155 Perform a service inspection on a load bank

R O N

Time: ___ . ___ . ____ Cut off: 27 minutes Rating: 1 2 3 4 5

Task F162 Perform a service inspection on a hydraulic test stand

R O N

Time: ___ . ___ . ____ Cut off: 40 minutes Rating: 1 2 3 4 5

Task I284 Remove and replace an alternator belt

R O N

Time: ___ . ___ . ____ Cut off: 41 mins. 2 sec. Rating: 1 2 3 4 5

Task I300 Replace the flare fitting on a fuel line

R O N

Time: ___ . ___ . ____ Cut off: 39 minutes Rating: 1 2 3 4 5

Task P549 Perform an operator's inspection of an AF vehicle, completing AFTO Form 373

R O N

Time: ___ . ___ . ____ Cut off: 27 minutes Rating: 1 2 3 4 5

TIMING FORM - AVIONIC COMMUNICATION AND NAVIGATION (AFS 455X2)

Examinee Name _____ SSN _____
Last First Middle Initial

Grade _____ AFS _____ Location (AFB)_____

Task E110 (173) **Research and identify information regarding parts using technical data**

R O N

Time: ___ . ___ . ____ Cut off: 24 minutes Rating: 1 2 3 4 5

Task E138 (160) **Complete AFTO Form, Maintenance Data Collection Record**

R O N

Time: ___ . ___ . ____ Cut off: 7 mins. 12 secs. Rating: 1 2 3 4 5

Task F169 (218) **Visually inspect receiver-transmitter (RT) units or other radio/test equipment received from supply or manufacturers**

R O N

Time: ___ . ___ . ____ Cut off: 36 minutes Rating: 1 2 3 4 5

Task F199 (233) **Safety wire system components**

R O N

Time: ___ . ___ . ____ Cut off: 8 min. 24 sec. Rating: 1 2 3 4 5

Task F200 (234) **Properly set up a flightline maintenance stand**

R O N

Time: ___ . ___ . ____ Cut off: 8 mins. 24 secs. Rating: 1 2 3 4 5

Task F206 (238) **Trace circuits or signals using aircraft wiring diagrams**

R O N

Time: ___ . ___ . ____ Cut off: 18 minutes Rating: 1 2 3 4 5

Task G262 (260) **Set up ultra high frequency test equipment**

R O N

Time: ___ . ___ . ____ Cut off: 9 mins. 24 secs. Rating: 1 2 3 4 5

Task G218 (250) **Perform a minimum standards (bench) check on an ultra high frequency (UHF) receiver-transmitter (RT)**

R O N

Time: ___ . ___ . ____ Cut off: 1 hour 48 mins. Rating: 1 2 3 4 5

Task L398 (539) **Isolate malfunctions in interphone cords**

R O N

Time: ___ . ___ . ____ Cut off: 18 minutes Rating: 1 2 3 4 5

TIMING FORM - PERSONNEL (AFS 723X0)

Examinee Name _____ SSN _____
Last First Middle Initial

Grade _____ AFS _____ Location (AFB)_____

Task E35 **Draft a message saying that a job inventory was mailed**

R O N

Time: ___ . ___ . ____ Cut off: 14 mins. 24 secs. Rating: 1 2 3 4 5

Task E102 (116) **Construct immediate inquiries to determine date of rank, unit (PAS), and duty phone for someone stationed at your base**

R O N

Time: ___ . ___ . ____ Cut off: 1 mins. 48 secs. Rating: 1 2 3 4 5

Task E107 (121) **Dispose of unclassified PDS products of only a few pages**

R O N

Time: ___ . ___ . ____ Cut off: 36 seconds Rating: 1 2 3 4 5

Task E114 (131) **Sign in a document and sign out again, using AF Form 614**

R O N

Time: ___ . ___ . ____ Cut off: 3 min. 36 sec. Rating: 1 2 3 4 5

Task F140 **Open and close a CRT in the CBPO**

R O N

Time: ___ . ___ . ____ Cut off: 2 mins. 24 secs. Rating: 1 2 3 4 5

Task L733 **Respond to a request to release information from a member's file in accordance with the Privacy Act**

R O N

Time: ___ . ___ . ____ Cut off: 6 minutes Rating: 1 2 3 4 5

Task O826 (719) **Properly file 10 documents in personnel records**

R O N

Time: ___ . ___ . ____ Cut off: 18 minutes Rating: 1 2 3 4 5

Task R1011 (896) **Compute service dates**

R O N

Time: ___ . ___ . ____ Cut off: 2 mins. 24 secs. Rating: 1 2 3 4 5

APPENDIX G

Supervisor Time Estimation Session Instructions

SUPERVISOR TIME ESTIMATION WORKSHOPS

Introduction

Good morning, my name is _____ and I'm with the Human Resources Research Organization. We are a contractor hired by the Air Force to examine better ways of selecting new airmen and placing them in appropriate jobs. Since we are not experts in the work you do, your participation in this study is extremely important in helping us improve how the Air Force manages its people. We have selected four Air Force specialties for data collection and analysis: 422X0 (Aircrew Life Support); 454X1 (AGE); 455X2 (Avionic Communication and Navigation); and 732X0 (Personnel). Everyone here should be in one of these four specialties.

Basically, what we will be asking you to do this morning is to estimate how long it would take some of the airmen who work for you to accomplish some of the tasks in your specialty. We realize that this is not an easy thing to do, but we will give you some instructions and materials that will hopefully make it easier. There are no right or wrong answers here, we simply want your best judgments as experts working in your various fields. You have the most experience working with your people and know best what their capabilities and limitations are. While you are here this morning your airmen are in another room taking a series of written tests. Later on this week we will be visiting some of your duty sections to observe some of your people at work.

Before we go on are there any questions?

Background Information Forms, Privacy Act Statements and Supervisor-Airmen Forms

We'd like to begin by handing out a batch of forms to each supervisor here today. I will read down through the list of supervisors. Please raise your hand when your name is called. **[Hand them a batch of forms including Supervisor-Airmen List, Background Information Form, Tasks for Time Estimation Booklets, and one Time Estimation Form. Note attendance on the master list of supervisors.]** Is there anybody whose name I did not call? **[If supervisor is not on list, find out if he/she is replacing one of the supervisors on the list. Ask the supervisor whose name is not on the list if his/her airmen are in the airmen testing session. Give him a blank Supervisor-Airmen List and help him/her fill the form out.]** Did anyone not get a batch of forms? Also, we have a supply of

pencils if anyone needs one. All the forms you will fill out today may be done in either pencil or pen.

The first sheet you received was the Supervisor-Airmen List that names the airmen for whom you will be making your time estimates. We need to be sure that we have the right information concerning the airmen who work for you. This sheet should identify you at the top of the form and then list some of the airmen who work for you. Please be sure that the top information is correct. Mark any corrections necessary, and then review the information at the bottom. Also, in the far right-hand column we need to know how many months you have supervised each airman. Please fill in the right hand column at this time. **[Pause.]** Does anyone see someone on their form who does not work for them? **[If so, call out the name to the supervisors from that particular specialty to see if one of them supervises the airman in question. If one of the supervisors does supervise the airman in question, then have the supervisor who supervises him/her add the airman's name to the Supervisor-Airman List. If more than one supervisor supervises the airman in question, then add the airman's name to the first-line supervisor with the fewest airmen to rate. Then have the supervisor who does not supervise the airman draw a line through the airman's name on the Supervisor-Airman List.]**

[Hand out task booklets with forms.]

The next sheet should be a Background Information Form with a Privacy Act Statement on it. Please read the Privacy Act Statement and take a few minutes to fill out the form. **[Wait until all appear to be finished.**

Task for Time Estimation Booklets and Time Estimation Forms

Next you will see a Task for Time Estimation Booklet for your specialty. Check the front cover of the booklet. Does everyone have the correct booklet for their specialty? Please do not mark in these booklets, we need to use them again at other bases we visit. You should also have a Time Estimation Form for the first airman listed on the Supervisor-Airmen List.

First, I'd like to talk a little about the Task for Time Estimation Booklets. We have tried to identify a set of tasks in each of your specialties that are commonly performed by airmen and junior NCOs. Clearly, these are not <u>all</u> of the tasks you do, only a representative sample. Each task is numbered, followed by a description of the task. You will notice that the tasks are described in quite

different levels of detail. The first group of tasks in your booklets have very specific descriptions and steps specified and even include the instructions you might give someone if you wanted to actually watch them doing the task. The second set of tasks, which appear towards the end of your booklets, describe the tasks in much less detail. One of the questions we are trying to answer is how much task detail is necessary to estimate performance time accurately. All we ask is that you take your best shot at estimating your airman's performance time on each task with whatever level of detail is provided. Do you have any questions about the Task for Time Estimation Booklets?

Now let's turn to the Time Estimation Forms. The top of the form includes a place for you to record your name, the person's name you are rating, and their Social Security number--you will find these on the Supervisor-Airmen Lists you reviewed earlier. Please fill out the top of the form at this time. [PAUSE.]

Please open your Task Booklet to the first page and look at the instructions for filling out the Time Estimation Form. Read along silently as I read aloud.

"The first column of the Time Estimation Form is a list of task numbers. These numbers correspond to the task numbers in your Task Booklets. The task numbers on the Time Estimation Form and the Task Booklets are in the same order. The next set of columns asks you to tell us how often you have observed your airmen doing each of the tasks. You provide this information by checking the box above the "R," "O," or "N" for each task. "R" means you regularly see him (or her) do the task, "O" means you have seen him do the task occasionally, and "N" means you have never seen him do the task.

The next section presents a time line with three time estimates. "Fastest" refers to the fastest this task could be done and still meet an acceptable level of performance. "Normal" refers to the ordinary time the average airman needs to do this task to the accepted level of performance. "Slowest" refers to the longest amount of time that could be allowed for performance of this task without negative consequences to the job. These time estimates were provided by six NCOs from your career field. These are provided for your information only and should not limit the estimates you make for your airmen. If you think one of your airmen could do a task faster than the "fastest" time provided, please put down what you think. If you think one of your airmen would take longer than the "slowest" time, put that down as well. Or if you estimate that your airman

may perform more quickly or slowly than the "normal" time, record that time. You are free to record any time you think appropriate for your airmen on each task.

The last column on this form is where you record your estimate of how long each of your airmen would take to do each of the tasks. Record your time in hours, minutes, and seconds, writing in the appropriate number in the boxes above "Hr," "Min," and "Sec." If you have never seen one of your airman perform a task, please give your best estimate of how long it would take him or her. Base your estimate on your knowledge of his or her performance on similar tasks in your specialty.

As an example, think about the task of "Starting a Car." Assume that you are estimating how long it would take an airman to start a motor pool car and that the airman has to check all mirrors, gauges, and seat/steering wheel positions. Look at the completed time estimation example below. The box above "R" was checked since you have regularly observed the person perform the task. The time estimates provided to you are 30 seconds for the fastest time, 1 minute for the normal time, and 2 minutes for the slowest time. You think about the particular airman you are rating and decide that he takes a little longer than the normal time, but not as long as the slow time and decide to give him 1 minute and 22 seconds as the time estimate. Therefore, you would put a "0" for zero hours in the "Hr" box, a "1" for 1 minute in the Min box, and a "22" for 22 seconds in the "Sec" box. Are there any questions?

We are also asking you to give an overall judgment about each airman regarding the relative amount of acceptable work they can perform in a typical day. This rating scale is presented on the last page of your Time Estimation Form. The question is worded:

> 'In your specialty, consider the maximum amount of acceptable work that can be done by a person in a typical day as 100 percent. What percent of the maximum could the person you are currently rating do in a typical day? Write your estimate in the box below.'

Look at the example below. Assume that 100% is the maximum amount of work that can be done and 1% is the least amount of work. If you believe that the airman you are rating can perform 75% of the maximum amount of work, write 75 in the box provided."

In making your estimates, please think about how long it would take each airman to do each task if he or she were working as quickly as they could, while maintaining satisfactory performance. The key words here are working quickly and satisfactory performance.

Supervisor Training

Before beginning work on estimating your times, I'd like to go over some basic information on making these estimates. First, we need to establish what we mean by performance time. In making your estimates, please think about how long it would take each airman to do each task if he or she were working as quickly as they could, while maintaining satisfactory performance. The key words here are working quickly and satisfactory performance.

There are some other things we need to clarify before we go on. In making your estimates, we want you to carefully consider each airman and each task separately. In making ratings or estimates like this we all have a tendency to generalize. In other words, if we think that a particular airman is generally a pretty good performer, the tendency is to give him or her fast performance times on all tasks when, in fact, it is very unlikely that he or she is truly good at everything. Your estimates should reflect the true strengths and weaknesses of each airman on the different tasks.

We also want you to evaluate each airman in the context of their maximum level of performance, not just the most recent performance you have observed. If they had a bad day last Friday and really messed something up, don't make that your baseline for evaluation. Try to think back to all the times you have seen him perform the various tasks and make your estimate on the basis of his best days.

Finally, we want you to only consider the performance of your airmen on the specific tasks listed in your booklets. If they are extremely strong or weak in other areas of performance, such as appearance, punctuality, attitude, etc., please try not to let that influence your estimates of their performance times on these specific tasks.

Are there any more questions before we take a short break? **[After all questions are answered, dismiss the group for 10-15 minutes. Remind them where the facilities are. Tell them to return to their same seat and leave all their materials where they are seated.]**

Final Instructions

Now for some final instructions before we get down to business. After you complete the Time Estimation Form for one of your airmen, please hold the form up for collection and we will give you a Time Estimation Form for the next airman on your list. When you have completed the last airman on your list, turn in all remaining materials--the Task Booklet, your Background Information Form and the Supervisor-Airman List. At that point you are free to go. Take as much time as you need--this is not a test and there are no time limits.

Remember, in making your estimates, please think about how long it would take each airman to do each task if he or she were working as quickly as they could, while maintaining satisfactory performance. The key words here are working quickly and satisfactory performance.

Again, we thank you for your time and participation in this important project. Unless you have any other questions, you may begin.

APPENDIX H

Scannable Answer Sheet

LAST NAME

AFSC

SOCIAL SECURITY NUMBER

L = LIKE I = INDIFFERENT D = DISLIKE

PART 1 — VOCATIONAL INTERESTS FOR CAREER ENHANCEMENT

SECTION 1

1 L I D	5 L I D	9 L I D	13 L I D	17 L I D	21 L I D	25 L I D	29 L I D
2 L I D	6 L I D	10 L I D	14 L I D	18 L I D	22 L I D	26 L I D	30 L I D
3 L I D	7 L I D	11 L I D	15 L I D	19 L I D	23 L I D	27 L I D	31 L I D
4 L I D	8 L I D	12 L I D	16 L I D	20 L I D	24 L I D	28 L I D	32 L I D

SECTION 2

33 L I D	45 L I D	57 L I D	69 L I D	81 L I D	93 L I D	105 L I D	117 L I D
34 L I D	46 L I D	58 L I D	70 L I D	82 L I D	94 L I D	106 L I D	118 L I D
35 L I D	47 L I D	59 L I D	71 L I D	83 L I D	95 L I D	107 L I D	119 L I D
36 L I D	48 L I D	60 L I D	72 L I D	84 L I D	96 L I D	108 L I D	120 L I D
37 L I D	49 L I D	61 L I D	73 L I D	85 L I D	97 L I D	109 L I D	121 L I D
38 L I D	50 L I D	62 L I D	74 L I D	86 L I D	98 L I D	110 L I D	122 L I D
39 L I D	51 L I D	63 L I D	75 L I D	87 L I D	99 L I D	111 L I D	123 L I D
40 L I D	52 L I D	64 L I D	76 L I D	88 L I D	100 L I D	112 L I D	124 L I D
41 L I D	53 L I D	65 L I D	77 L I D	89 L I D	101 L I D	113 L I D	125 L I D
42 L I D	54 L I D	66 L I D	78 L I D	90 L I D	102 L I D	114 L I D	
43 L I D	55 L I D	67 L I D	79 L I D	91 L I D	103 L I D	115 L I D	
44 L I D	56 L I D	68 L I D	80 L I D	92 L I D	104 L I D	116 L I D	

SECTION 3

126 L I D	130 L I D	134 L I D	138 L I D	142 L I D	146 L I D	150 L I D
127 L I D	131 L I D	135 L I D	139 L I D	143 L I D	147 L I D	151 L I D
128 L I D	132 L I D	136 L I D	140 L I D	144 L I D	148 L I D	152 L I D
129 L I D	133 L I D	137 L I D	141 L I D	145 L I D	149 L I D	

SECTION 4

153 L I D	155 L I D	157 L I D	159 L I D	
154 L I D	156 L I D	158 L I D	160 L I D	

PART 2 — GENERAL SCALE

1 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	9 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	17 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	25 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
2 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	10 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	18 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	26 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
3 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	11 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	19 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	27 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
4 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	12 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	20 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	28 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
5 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	13 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	21 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	29 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
6 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	14 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	22 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	30 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ
7 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	15 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	23 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	
8 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	16 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	24 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ	

PART 3 — JOB KNOWLEDGE TEST

1 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	16 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	31 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	46 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	61 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	17 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	32 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	47 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	62 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
3 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	18 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	33 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	48 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	63 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
4 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	19 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	34 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	49 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	64 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
5 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	20 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	35 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	50 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	65 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	21 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	36 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	51 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	66 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
7 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	22 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	37 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	52 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	67 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
8 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	23 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	38 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	53 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	68 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
9 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	24 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	39 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	54 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	69 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
10 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	25 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	40 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	55 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	70 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
11 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	26 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	41 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	56 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	71 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
12 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	27 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	42 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	57 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	72 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
13 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	28 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	43 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	58 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	73 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
14 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	29 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	44 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	59 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	74 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
15 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	30 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	45 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	60 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	75 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

APPENDIX I

Airman Testing Session Instructions

AIRMAN TESTING SESSIONS

Introduction

Good morning/afternoon, my name is _____ and I'm with the Human Resources Research Organization. We are a contractor hired by the Air Force to examine better ways of selecting new airmen and placing them in appropriate jobs. Since we are not experts in the work you do, your participation in this study is extremely important in helping us improve how the Air Force manages its people. We have selected four Air Force specialties for data collection and analysis: 122X0 (Aircrew Life Support); 454X1 (AGE); 455X2 (Avionic Communication and Navigation Systems); and 732X0 (Personnel). Everyone here should be in one of these four specialties.

We have handed out a lot of paperwork that is unique to your specialty so we have divided you up into four groups. **[Identify the locations of the four groups and ensure that everyone is in the right section.]**

Basically, what we will be asking you to do this morning/afternoon is to give us your opinions on a variety of subjects, including the kinds of work you like to do and your work habits and attitudes. We will also be testing some of you to determine how much you know about some of the tasks you do in your jobs. The information we are collecting is for research only; none of it will appear anywhere in your permanent records nor will it be used in any way to affect your careers. Later this week, we will be visiting your duty sections to observe some of you at work.

Before we go on are there any questions?

Before we start, we'd like to go through the list of names of airmen who should be here today. Please say "here" when your name is called. **[Take roll.]** Is there anyone here whose name I did not call? **[Pass out a 3x5 card and ask them to record their name, rank, AFSC, unit, and first-line supervisor.]**

Background Information Forms and Privacy Act Statements

We'd like to begin by having you fill out a Background Information Form with a Privacy Act Statement on it. Please read the Privacy Act Statement and take a few minutes to fill out the form. The form asks for some basic background information on you and is pretty straightforward. All the forms you will fill out today must be done with a Number 2 pencil.

Now look at the standard multiple-choice scannable answer sheet. This morning you will be given three different questionnaires, but will be using only this one answer sheet to record all of your answers. As with all answer sheets like this, be sure to fill in only one circle for each item. Fill in the circle completely, erase any stray marks, and if you have to change an answer, erase your first mark completely and then mark your new choice. Please notice that the form is in 3 parts--part 1 is on the front and parts 2 and 3 are on the back.

The front side also has space for your last name, your Social Security number and your Air Force Specialty Code. Please go to the last box in the name section. We are using this box to record the base you are assigned to. Since you are all assigned to _____ Air Force base, we need all of you to put the letter ___ in the last box and fill in the circle for this letter down below. Now go ahead and print your last name in the blocks in the "Last Name" section and fill in the appropriate circles. Now go down and do the same thing for your Social Security number and your AFSC, first writing the numbers in the boxes and then filling in the appropriate circle below each number. Please code in your skill level as the fourth digit of your AFSC. **[Use duty AFSC with current skill level.]** Does anyone have any questions so far?

Vocational Interest for Career Enhancement

The first questionnaire we have for you today is the Vocational Interest for Career Enhancement, or VOICE. Please don't start yet and please do not mark in these booklets since we have to use them again at other bases. Some of you may have taken this when you went through basic training at Lackland Air Force Base, but we need for you to do it again, since your interests may have changed since then. These questions are designed to tell us the kind of work you <u>like</u> to do. This is not a test, so there are no right or wrong answers. Each item consists of a description of some activity or job. For each activity you are to indicate on the answer sheet whether you like, dislike, or are indifferent about (neither like nor dislike) the activity. Please carefully fill in the circle marked "L" for like, "I" for indifferent, or "D" for dislike next to each item number on your answer sheet, again using only a number 2 pencil.

Please open the VOICE booklet to the first page and read along silently as I read aloud.

"The purpose of this inventory is to determine which of a number of occupations you would like. This is not an intelligence test or a test of special abilities. There are no right answers. The right answer for you is the one that best describes your liking for the type of work or activity presented. All your marks should be made on the answer sheet provided with this booklet. Make sure you use the soft lead pencil provided or any other soft lead pencil. Do not mark on the booklet."

And now we will go on to the instructions for completing the VOICE.

There are four sections to VOICE and part 1 of your answer sheet is divided into four sections corresponding to the sections in the booklet. Section 1 is a set of job titles; section 2 is a list of duties from a number of different jobs; section 3 lists leisure time activities; and section 4 lists things you might want to study. Read the instructions at the beginning of each section and fill in one circle for each item on your answer sheet. Remember "L" means you like the activity, "I" means you neither like nor dislike the activity, and "D" means you dislike the activity.

There is no time limit, but work fairly quickly and give your first reaction to each item. Work through all four sections of the VOICE before stopping and remain seated until everyone is finished. If there aren't any questions, you may begin. **[Pause. Should take about 30 minutes.]**

It looks like everyone is finished. Please keep your answer sheets but pass the VOICE booklets forward so we can collect them. **[Collect all VOICE booklets.]**

General Scale

Next we want to get some of your opinions and attitudes toward work in general. The next questionnaire in your packet is called the General Scale. Please don't start yet and, again, please do not mark in the booklets. This booklet has only 30 items which correspond to Part 2 on the back of your answer sheet. You will be asked to agree or disagree with a series of statements. Look at the instructions printed on the front page of the General Scale booklet. Please read along silently as I read aloud.

"To familiarize yourself with this questionnaire, it would be useful to scan it quickly before answering any of the items. It is a good idea to work rather fast and to give your first reaction

to each item. Some of the statements may seem alike to you, but all of them are necessary to show slight differences of opinion. Because your opinion is being asked for, there are no right or wrong answers. Also, keep in mind that the responses to this questionnaire are being kept confidential, so answer items as honestly as you can.

Please do not make any marks in this booklet. You should record your answers on Part 2 - General Scale, located on Side 2 of the separate answer sheet. Mark the circle on your answer sheet that corresponds with your opinion using the following scale:

Blacken the circle marked "A" if you **strongly disagree** with the statement.

Blacken the circle marked "B" if you **disagree** with the statement.

"C" if you **slightly disagree**

"D" if you **neither agree nor disagree**

"E" if you **slightly agree**

"F" if you **agree**

"G" if you **strongly agree**

The scale is printed at the top of the following two pages for reference. When you are told to begin, read through the questionnaire items one at a time and begin recording your answers on the "General Scale" section on the answer sheet."

When everyone is finished we will give you a break, but please remain seated until all are done. You may begin. **[Pause while all complete.]**

Please pass the General Scale booklets forward so we can collect them. **[Collect General Scale Booklets.]** Those of you in the 455X2 (Avionic Communication and Navigation Systems) career field are now finished. **[Point to these people.]** Please pass your Background Information Forms, answer

sheets, and pencils forward to be collected. **[Collect forms, answer sheets, and pencils.]** We really appreciate your help and will be seeing some of you later on this week in your duty sections. **[Wait for 455X2 airmen to leave the room.]** For those of you in Aircrew Life Support, Personnel, and AGE, we have one more thing for you to do, but first we'll take a 15 minute break. Please leave your answer sheet on the top of your desk/table and return to your same seat after the break. **[Remind them where the facilities are.]**

Job Knowledge Tests

For those of you remaining we have just one more task. This is the Job Knowledge Test for your career field. Again, we ask that you not mark in these books so we can use them again. Unlike the first two questionnaires we did, the questions on the Job Knowledge Test have one correct answer, so you should do your best to pick the correct answer. You will record the answers to these questions in Part 3 on the back of your answer sheets in the area labeled "Part 3 - Job Knowledge Test," again using only a number 2 pencil. Does anyone need another pencil?

All of the questions are multiple choice, having up to 5 choices. After you read the question or statement and decide on the correct response--there is only one best response for each item--fill in the circle for the letter corresponding to your choice on the answer sheet. Open your Job Knowledge Tests to page 1 and read along as I read aloud:

> "Each item in this booklet consists of a question or statement followed by several choices. There is only one choice that answers the question or completes the statement correctly. Be sure to read each question and all of the choices before answering. Decide which choice is correct and blacken the letter on your answer sheet that matches the letter and item number."
>
> The example in your instructions shows "C" filled in since Washington, DC is the capitol of the United States and "C" is the correct answer.
>
> "Be sure to use a number 2 pencil and blacken only one circle for each item. Erase any stray marks being careful not to tear the answer sheet. If you have to change an answer, erase your first mark completely, and then mark your new choice.

The questions in this booklet are grouped by task. Read the task number and title at the top of each page to determine when you have started a new task. **[Point to task number and title.]**

Do not spend too much time on any one item. If you have trouble with an item, skip it, and come back to it after you finish the other items. Although you may be unfamiliar with a task, make the best choice you can for each item. Try to answer every item."

The three tests are of different lengths, so don't be concerned if you don't use all of the items on your answer sheet or if some people in the room finish before you. This is not a timed test, so take as much time as you need. Are there any questions before we begin? **[Pause.]**

When you are finished, please bring the test book, your answer sheet, and your Background Information Form to the front of the room before you leave. We would also like to have the pencils back. We thank you for your help in this important project. If there are no further questions, you may begin. **[Collect materials as airmen finish.]**

APPENDIX J

Task Timing Session Instructions

TIMING SESSIONS

Instructions to Senior NCOs

Introduction

We are researchers from the Air Force Armstrong Laboratory, Human Resources Directorate (formerly the Air Force Human Resources Laboratory) and one of its contractors, the Human Resources Research Organization (HumRRO). We are here this week collecting data for a research project examining better ways of selecting and classifying new recruits. This phase of the project will consist of timing a few airmen in your career field as they perform some common tasks.

Task Booklets

Because we know very little about the work done in this specialty, we have asked for your assistance in setting up the tasks to be timed and in evaluating the quality of each airman's performance. The tasks we are going to time are described in this booklet **[provide a copy of the appropriate task booklet]** As you will notice, each task is numbered and starts with a one or two sentence description of the work to be performed followed by a set of three times referred to as "Time Estimates". These times were estimated recently by a group of six NCOs from your career field in a workshop at Brooks AFB.

We will not be using any of these times today except to establish a cut-off for those airman who are having extreme difficulty completing a task. We will say "STOP" if the airman reaches the cutoff time.

The task descriptions in the booklet also include a list of the equipment and materials needed to perform each task--these lists were provided to you prior to our visit. Have you had any problem gathering up the materials?

The task descriptions also include a little background on what we are attempting to measure with the task and a description of the configuration of the equipment and environment at the time the task is being performed. We want to try and keep this configuration the same for each airman who performs the task, so the resulting times are comparable. The task booklet also contains a set of narrative instructions to be verbally given to the airman and a list of the steps and actions the airman should take to properly perform the task. Let's look over a few tasks in the booklet to see if you have any questions. **[review tasks with the NCO]**

Timing Forms

Now let's go over the data sheet we will be using to record information on each airman as they perform some of these tasks. At the top of the form we have recorded the airman's name, SSAN, grade AFS and base of assignment so we can later match their task performance times with other data we are collecting. The form then includes space to record information on up to eleven tasks. For each task we have recorded the task number and title from the booklet, and the cut-off time for that task. During the timing, we will be recording the actual time it took that airman to do the task, and finally a proficiency rating, to be provided by you, indicating how well the airman did the task. This rating is on a 1 to 5 scale with 5 being the best and 1 being the worst. Please review the scale description printed on the green card **[hand out rating card]**.

5 = Exceptional Far exceeds the acceptable level of performance. Completed all steps, critical and

noncritical, efficiently (skillfully) and accurately.

4 = Distinguished	Exceeds the acceptable level of performance. Completed all critical steps accurately, but not necessarily efficiently. Made very few or no noncritical errors.
3 = Acceptable	Meets the minimum acceptable level of performance. Completed all critical steps accurately. Made some noncritical errors.
2 = Deficient	Below the acceptable level of performance. Made some critical errors or numerous noncritical errors.
1 = Unacceptable	Far below the acceptable level of performance. Made numerous critical and noncritical errors and/or could not complete the task.

Critical steps are those steps that absolutely must be performed to correctly and safely complete the task. Noncritical steps are steps of less importance; failure to perform a noncritical step will not necessarily lead to incorrect overall performance of the task, or an unsafe condition. Do you have any questions about the data collection forms or the rating scale? **[respond to questions]**

Timing Procedure

The first step in collecting this data will be to set up all the materials required for the task. Again, to help ensure consistency we want to be sure that the set-up is the same for each airman that we time.

The next step will be to instruct the airman. Before we have you give the airman the specific instructions for the task to be performed, we will give him (or her) some general ground rules. We will tell the airman that we want him (or her) to work as quickly as possible, while completing the task to a satisfactory level of performance. We want to find out how quickly the airman can perform the task to a satisfactory level. We will also assure him (or her) that the data is being collected for research purposes only and will have no impact on him (or her) personally.

We will also instruct the airman that after we tell them to "begin" (and start the clock) he should keep working at the task until they either complete it or we tell him to stop. When he thinks he is finished, he is to say "finished" and we will stop the clock and record his performance time. He will be told that he may not ask any questions or request assistance once the timing begins. You may use the task step descriptions in the booklet to keep track of how many steps are correctly performed to help you make the proficiency rating when the task is complete. If you see an airman doing something wrong, do not say anything or help him. If an airman is totally unable to accomplish a task, we will let him work at it until the cut-off time is reached and then tell them to stop. If this occurs, we will record the cut-off time as his task performance time.

If an airman is not qualified to perform a given task, we would still like the airman to attempt the task. This is provided that it would be safe for him or her to do so and that it would not violate any regulations. (If an airman refuses to do a task, he or she should be encouraged to do it, but not forced.)

If the airman does not finish the task by the cutoff time, he will be given a rating of "1" which is unacceptable. If the airman states that he has completed the task, you may give him any rating.

After an airman finishes one task we will immediately begin the set-up for the next task. We have a lot of timing to do this week, so we must keep the airmen moving through the tasks as quickly as

possible. When one airman has gone through all the tasks, we will then start over with the next airman.

After we give the airman the general instructions, we will let you read them the specific instructions for the task and ask if they have any questions. **[Show NCO the part that they are to read.]** You can answer questions relating to the timing procedures, but do not give them any help in how to actually perform the task itself--we are trying to measure their proficiency, not yours. Do you have any questions or comments before we get started? **[respond to questions]**

TIMING SESSIONS

Instructions to airmen being timed

Introduction

We are researchers from the Air Force Armstrong Laboratory, Human Resources Directorate (formerly the Air Force Human Resources Laboratory) and one of its contractors, the Human Resources Research Organization (HumRRO). We are here this week collecting data for a research project examining better ways of selecting and classifying new recruits. This phase of the project will consist of timing you and a few other airmen in your career field as you perform some common tasks. We really appreciate your participation in this project. The data we collect will help the Air Force do a better job of picking the right people and placing them in the proper career fields. Earlier this week we got some written information from you on your job interests and attitudes and now we need to get some actual job performance data. We will be timing you on a number of tasks performed by airmen in your career field.

As we said earlier this week, the information we are collecting is for research only. Nothing we collect regarding your performance will become part of your records nor will it be used in any way to evaluate you or affect your career.

Timing Procedures

Sgt _____ here will be helping us set up a few tasks commonly done by airmen and junior NCOs in your career field. He will give you some instructions on what we want done and then will watch as you perform the task while we time you. Before he gives you the instructions for the first task we need to go over a few things.

First, please look over the information at the top of this Timing Form to be sure we have your name, SSAN, grade and AFS correct. Let us know if there are any errors. **[mark any corrections required]**

Before we start timing, you may ask questions about the timing procedures; however, you may <u>not</u> ask for help in how to actually perform the task--that is what we are trying to measure. Once we say "begin" and the timing starts you should work as quickly as possible, without any assistance, until you feel you have <u>satisfactorily</u> completed the task, at which time you are to say "finished". However, if during the task you would like to have the instructions repeated, then you may ask. We want to see how fast you can complete the task while doing it satisfactorily. If you are having trouble completing a task, don't panic or worry about it--just keep trying until we tell you to stop.

After you finish one task we will immediately set up the next one so we can get through all the airmen and tasks we have to time today. If you need a break between tasks, let us know--but please don't take a break <u>during</u> any of the tasks. Do you have any questions? **[respond to questions]**

Sgt _____ will now give you instructions for the first task. Remember, do not start until we say "begin", no asking for help once you begin, and say "finished" when you are done. Remember to perform the task as quickly as you can, while performing at a satisfactory level of performance. Over to you Sgt _____.